HOW TO
READ PLANS
AND
TAKE OFF BILLS
OF MATERIAL

By WM. A. RADFORD

HOW TO READ PLANS
AND TAKE OFF BILLS OF MATERIAL

¶ A simple and practical treatise illustrating and explaining the value—to the retail lumberman, the contractor and the mechanic—of being able to read a set of plans intelligently and to arrive at a correct understanding of the character of the work to be done and the quantities of materials of all kinds required.

¶ Given in simple language and illustrated with plates, diagrams, and detailed drawings that are easily understood.

By WILLIAM A. RADFORD

President of the Radford Architectural Company; Editor-in-Chief "American Builder"; Publisher "Radford's Cyclopedia of Construction"; "Radford's Estimating and Contracting"; "Details of Building Construction"; "Guaranteed Building Plans"; etc., etc.

THE RADFORD ARCHITECTURAL COMPANY
CHICAGO, ILLINOIS

CHAPTER II.

ELEMENTARY FACTS ABOUT PLAN MAKING

This chapter serves as an introduction to the general theme of plan making and interpreting.

This information is largely of a primary character and may not be required by the user of this book, save as a means of refreshing memory and making sure of your information on certain points. It is inserted here to make this work complete and comprehensive in every sense.

Kinds of Drawings.

Drawings are of several kinds, such as perspective, isometric, orthographic, etc. It will suffice here to call attention to the difference between perspective and working drawings. Perspective drawings are similar to photographs and engravings usually given in books.

As a very simple example of such a drawing, and of its advantages and defects, let us take two blocks of wood placed one on the other, as shown in Fig. 1. The precise arrangement of the two blocks, and the general appearance which they represent, are very well shown, but it would be impossible to ascertain the exact size or proportion of the different parts. Measured by the dividers, the further ends of the

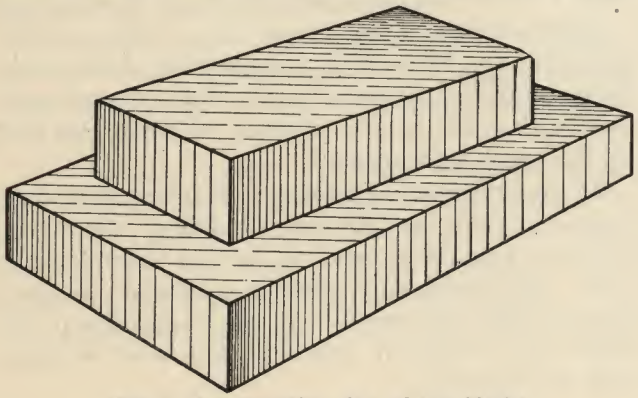


Fig. 1—A perspective view of two blocks.

blocks are narrower than those that are nearer, and unless the reader is able to lay out the lines according to which the drawing was made, it will be impossible for him to say whether this difference is due to actual size, or to the convergence or narrowing caused by the perspective. If, instead of a simple pair of blocks, like those shown in Fig. 1, the arrangement was a completed structure, it will be clear that a perspective could not be followed as a working drawing, except to give a general idea of how the building will look when completed.

Working Drawings.

Working drawings are therefore drawn in the simplest possible way; the outlines being drawn as if the building was small enough to be placed on a table before you, so that you could see every part without moving your eyes. Every foot of the real object is represented by a smaller space on the drawing. For example, a 1-foot object may appear to be only 1-inch on the drawing, etc. More will be explained about this later when the subject of drawing to scale is discussed.

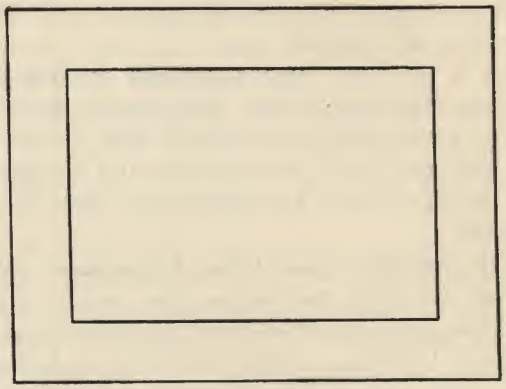


Fig. 2—A plan of Fig 1.

In Fig. 2 the two blocks are shown resting on each other as shown in Fig. 1; only you are supposed to be directly over the centers of the blocks at a considerable height, so that you could see all the parts without moving your eyes. As seen in Fig. 2, however, it would be impossible to say whether the lines bounding the figure show a hole or projection.

To avoid such misunderstanding, draftsmen are in the habit of using what are called shade lines—that is to say, thick lines, such as are shown in Figs. 3 and 4. In Fig. 3 the outlines are shaded as if the inner rectangle represented a hole; in Fig. 4 the shading represents a projection, and the impressions made on the mind by such lining is fortunately quite plain. No one could mistake Fig. 3 for two blocks lying one on top of the other, or Fig. 4 for a block with a hole in it. Nevertheless such shading is to a certain extent conventional—that is to say, it is followed by a sort of agreement amongst draftsmen without regard to actual light and shade, as

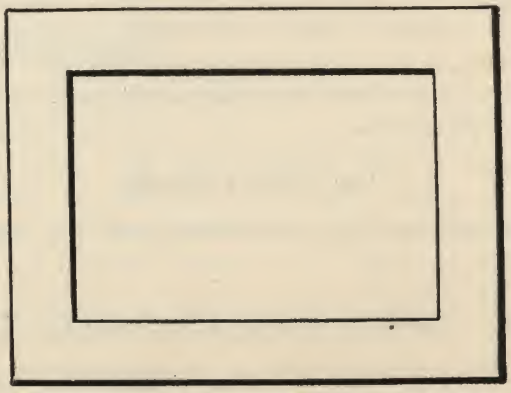


Fig. 3—Plan of block with rectangular hole.

existing in nature, for in mechanical drawing the light is always supposed to fall in one direction, which is such that the edges bounding the right hand and lower surfaces on the drawing are shade lines.

Every Line an Edge.

Remember that every line (except shade lines), represents an edge of the object, that is, the limit of

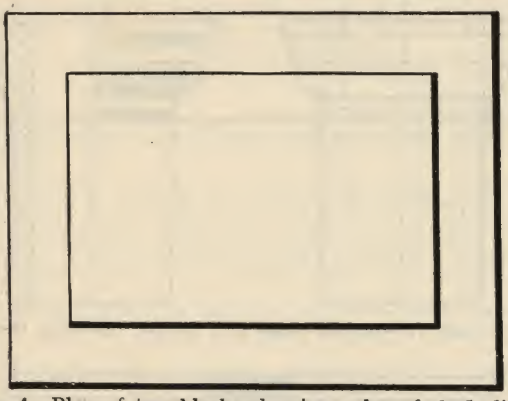


Fig. 4—Plan of two blocks showing value of shade lines.

the object, whether it is only a small block of wood, a part of a moulding, a complete house, or only a single board of a house.

Thus on a drawing a four-sided figure may represent one face of a flat surface, a curved surface, or a slanting surface. To know which is meant, reference must be made to the other views, about which more will be said further on.

But although the reader would have no difficulty in determining that Fig. 3 is a block with a hole, and Fig. 4 a block with a projection, these figures, called plans, give no idea of the depth of the hole or the height of the block. To determine these points in this kind of drawing, other figures must be introduced. These figures are known as elevations and sections.

From the above we will see that neither a perspective view nor a simple plan will enable those who are not very expert to determine the exact dimensions even of such a simple object as two blocks lying one on the other.

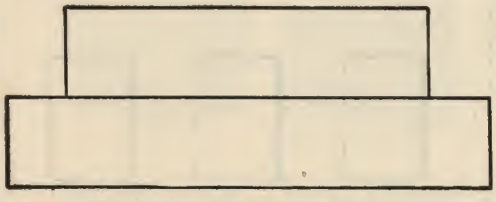


Fig. 5—Front elevation of Fig. 1.

Detail Essential to Understanding.

Fig. 1 being a perspective view, and Fig. 2 a plan of two blocks, it is evident that it requires a drawing like Fig. 5 to give the precise thickness of the blocks. Such a figure is called an elevation, and these two figures (2 and 5) are all that are necessary to enable us to reproduce the object from which they were drawn. The example that we have given is, however, probably the simplest that could have been chosen, and greater complication would have required a change in our method of drawing it.

Suppose that instead of two blocks lying one on the other, the object had been a block with a hole in it, such as is shown in Fig. 6. A plan of Fig. 6 is given in Fig. 3, but an elevation of Fig. 3 would be like Fig. 7. This would give us the thickness of the block, and as the length and width of the hole are shown on the plan, it would be easy to reproduce the article. Instead of an elevation, however, most draftsmen would give a section of Fig. 6, as shown in Fig. 8. This shows the block as if it were cut in two (along the line A. B. Fig. 6), and the ends of the solid part of the block are seen in section, as it is called.

Indicating a Section.

The reader will here notice that the lines on these different figures run in different directions. The direction of each line is intended to express something. Thus, mere shading lines, like those of Figs. 1 and 6, run either horizontally or perpendicularly. The

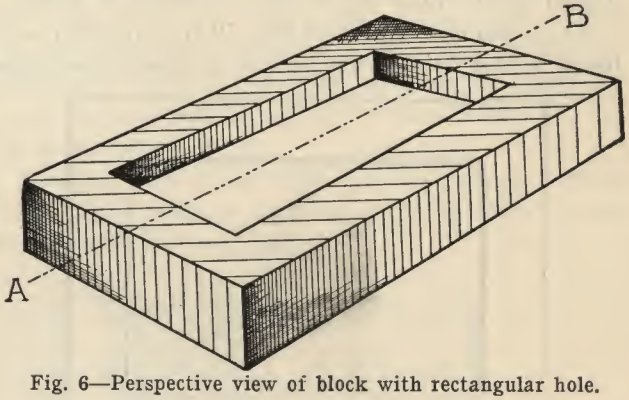


Fig. 6—Perspective view of block with rectangular hole.

lines on sections always run diagonally, making an angle of forty-five degrees with the perpendicular. Such a direction of the lines always indicates a section. Sometimes sections are colored or filled in solid—a broad heavy line as it were; further on this subject will be mentioned again, so as to show the uses and different methods of representing sections.

A section must always be carried thru on a certain line. For example, as previously stated, Fig. 8 is a section on line A, B, Fig. 6. Everything thru which the line A, B passes, is shown in section, as the reader will clearly see. Cutting thru on the line A, B also brings to view the parts which are behind that line and these parts are shown in elevation: thus Fig. 8 is part elevation and part section.

So far, to show the true form of a block with a hole in it, we have had a separate plan, an elevation and section elevation. Sections, or hidden parts, are however frequently represented on the plan or elevations by means of dotted lines, thus saving the

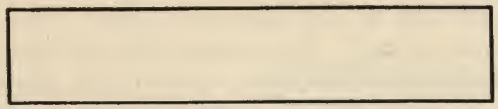


Fig. 7—Elevation of block with rectangular hole.

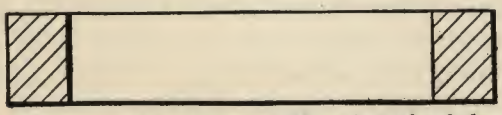


Fig. 8—Section of block with rectangular hole.

labor of drawing and extra view and also saving the workmen the bother of comparing too many drawings to get the necessary information. Too many drawings are almost as bad as too few.

Significance of Dotted Lines.

Dotted lines on plans also show what is above as well as what is below the floor level. Thus: dotted lines on a cellar plan show the footings and also the girders above; a little judgment will prevent any mistakes, as the meaning is clear. Beamed ceilings are also shown dotted, as will be seen on the first-floor plan of the complete set of plans given further on. Arches, cased openings, etc., are also shown dotted on the plan which later is given in detail.

Fig. 9 shows a plan and Fig. 10 the elevation of a block with a hole. This method of showing sections

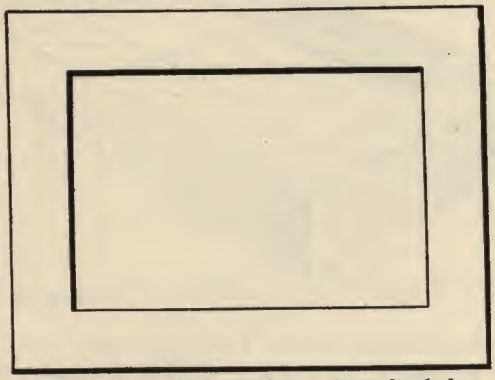
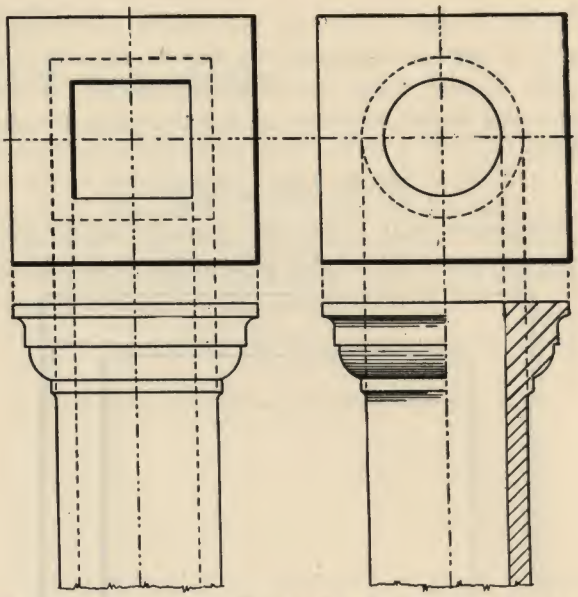


Fig. 9—Plan of block with rectangular hole.

is largely used. Care must be taken to examine both the plan and the elevation, so as to know what is wanted. The dotted lines, showing the section for a block with a rectangular hole, are the same as for a circular hole; the only way to know what shape is meant is by looking at the plan. Fig. 11 shows a plan and elevation of a portion of a cast-iron column.

Another way frequently used to show a section is by having one drawing showing both the outside elevation and section as shown in Fig. 12, which shows a similar portion of the column as Fig. 11;

Fig. 10—Elevation with dotted lines showing hole.



Figs. 11 and 12—Dotted lines and section showing thickness.

Fig. 13—Section of T iron shown on elevation.

Fig. 11 showing a square column and Fig. 12 a round column. This method of showing only half of the elevation and section is still further made use of by draftsmen, as frequently only half of gable ornaments or grilles, etc., are shown; the workman is of course supposed to understand that the other

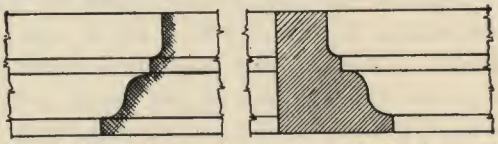


Fig. 14—Methods of showing cross sections of mouldings.

half is to be made the same, so as to get a symmetrical whole.

Sectional Details.

Frequently only one view of an object is drawn with a section shown in some part of it, as the draw-

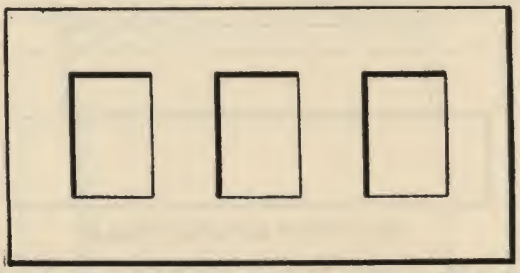


Fig. 15—Plan of block with three rectangular holes.

Fig. 16—Cross section of block with three rectangular holes.

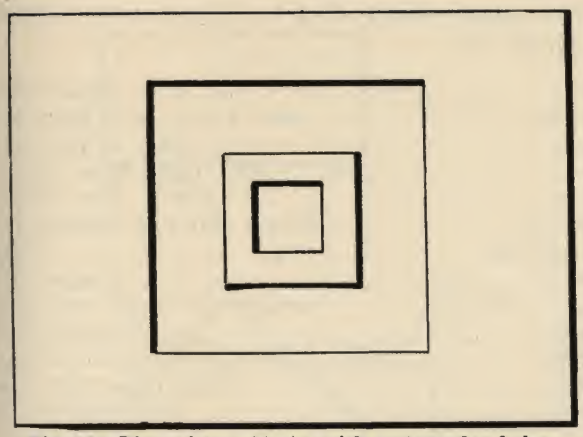


Fig. 17—Plan of two blocks with rectangular holes.

ing of a T-iron in Fig. 13 and the moulding, Fig. 14, which shows two methods; that on the left shows the entire section of the moulding, while the method shown on the right gives merely the contour or outline of the curved part.

When a sectional view of a more complicated design is presented, particular attention should be paid to the section lines. In Fig. 16 all the section lines slant in the same direction, thus showing that the whole is one piece, as may be seen from the plan, Fig. 15.

When two or more separate pieces are to be shown,

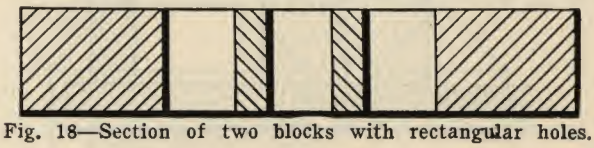


Fig. 18—Section of two blocks with rectangular holes.

the section lines slant in different directions, as in Figs. 17 and 18. Where this is done, one can tell from the section alone that there are two separate pieces.

CHAPTER III.

HOW DIFFERENT MATERIALS ARE SHOWN IN SECTION

Where a piece of mill work or other detail of a building is composed of a large number of different pieces, these must be distinctly shown in the sectional views. This is usually accomplished by varying both the direction of the section lines and their distances apart. Fig. 20 will make this clear, so whenever the section lines do not continue, one will know that the section shows a different piece from the one adjoining it.

To show the various materials used in a building, different forms of section lining are used. Thus Fig. 19 gives the conventions used by a number of draftsmen. Usually on some part of the drawing a key or explanation of the section lining will be given to make it clear.

Another plan is to color the sections—a certain color representing a certain material; thus a red would indicate brick, etc.

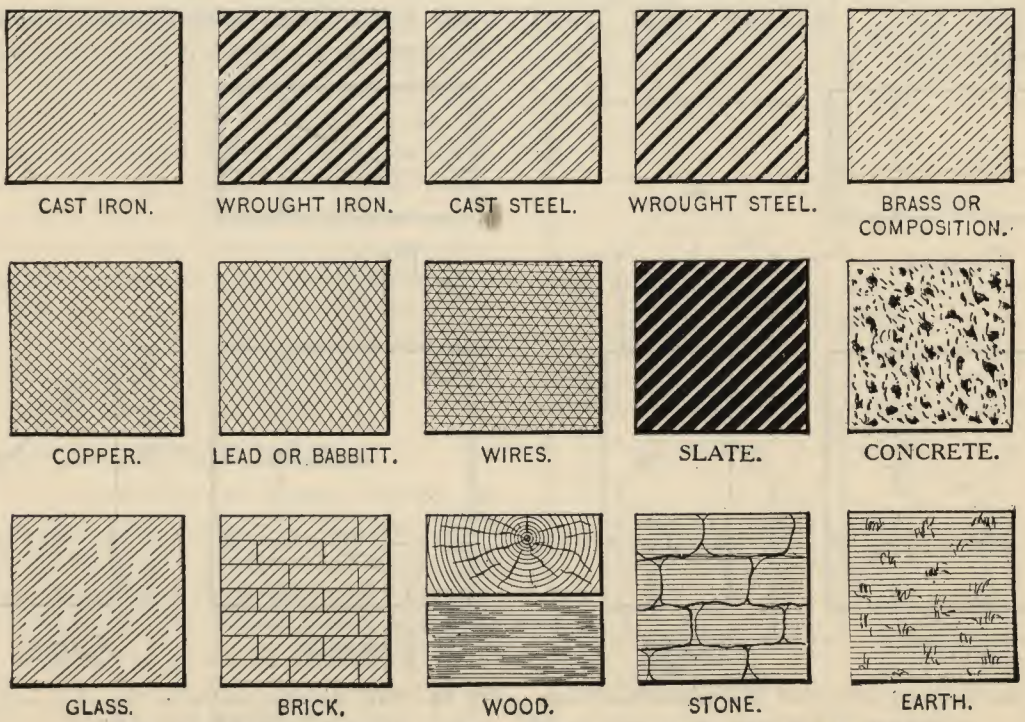


Fig. 19—Different methods of section lining to represent various materials.

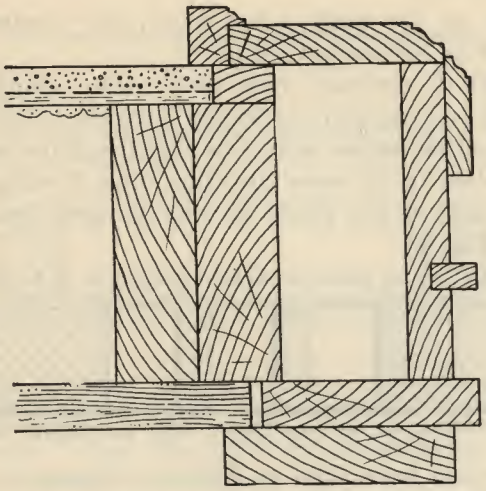


Fig. 20—Use of sectional lines to show various parts.

The colors chiefly used to represent the various materials are:

Earth	Burnt Umber
Concrete	Blue or Sepia with Black Dots
Stone	Blue or Pale Sepia
Brick	Red (Light Burnt Sienna)
Wood	Yellow (Raw Sienna)
Cast-iron	Neutral Tint with Prussian Blue
Wrought-iron	Indigo
Steel	Prussian Blue
Lead	Neutral Tint tinged with Indigo
Brass	Chrome Yellow
Copper	Chrome Yellow tinged with Burnt Sienna
Slate	Indigo tinged with Lake
Plaster	Pale Neutral Tint
Glass	Light Green

The coloring being done in colored inks, ordinary water-colors or colored crayons.

CHAPTER IV.

RELATION OF PARTS OF A DRAWING TO EACH OTHER

In speaking of "the plans" of a house, it is meant to include all the drawings consisting of plans, elevations, details, sections, etc.

The general drawings or plans are drawings in which every part is shown in its correct place, but the details are usually not shown; to show these, special drawings to a larger scale are made, and these are called "detail drawings."

In a set of plans for a building a plan is given for each floor, cellar, roof, and sometimes the framing, and to know which one is being discussed, they are marked "cellar plan," "first-floor plan," "roof plan," "framing plan," etc.

An Elevation.

An elevation is given of each side of the building, and these are called Front Elevation, Rear Elevation, and Side Elevations, according to which part of the outside of the building the drawing is to represent. The side elevations are often referred to as Right Side Elevation or Left Side Elevation, the right and left being that of a person standing in front of the building and facing it.

Sometimes the elevations are marked according to the direction of the compass which the side of the house faces. If a building faces to the east, the elevation representing this side of the house is called

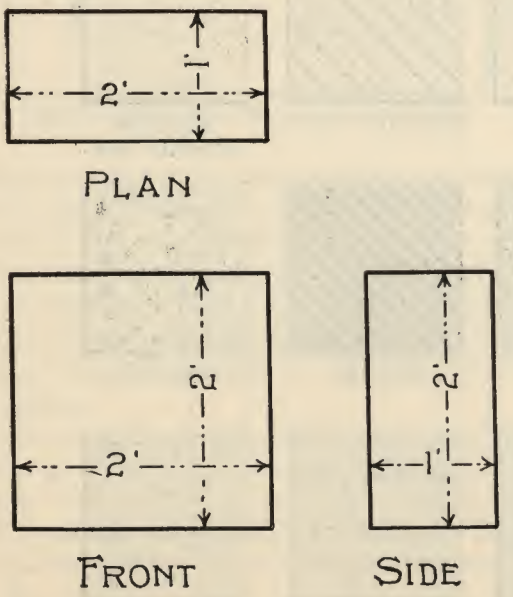


Fig. 21—Plan, elevation and side view of a rectangular block, square at all corners.

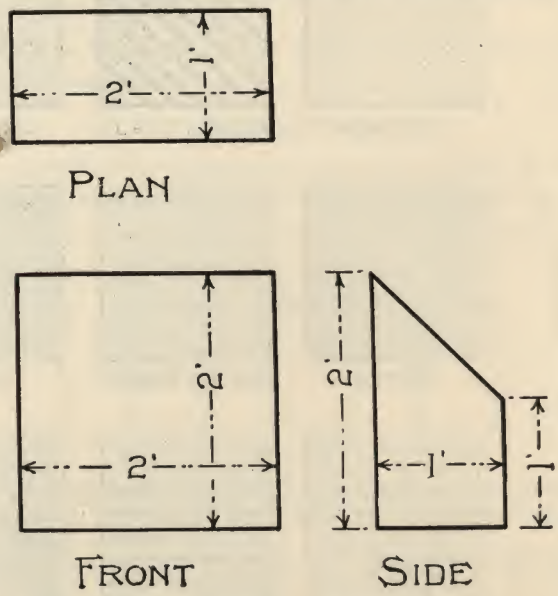


Fig. 22—Plan, elevation and side view of a rectangular block beveled on one side.

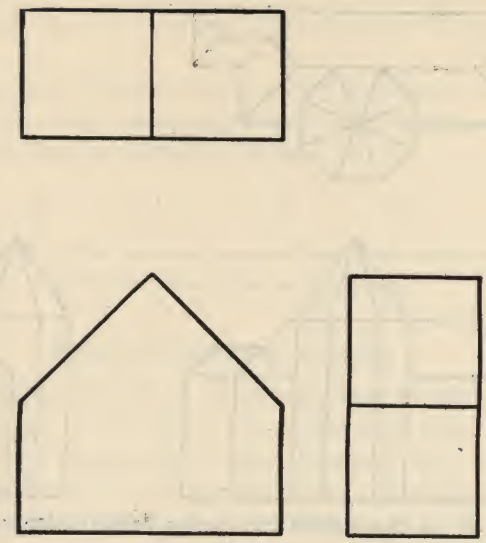


Fig. 23—Plan, elevation and side view of rectangular block with both sides beveled; resembling a house with gable roof.

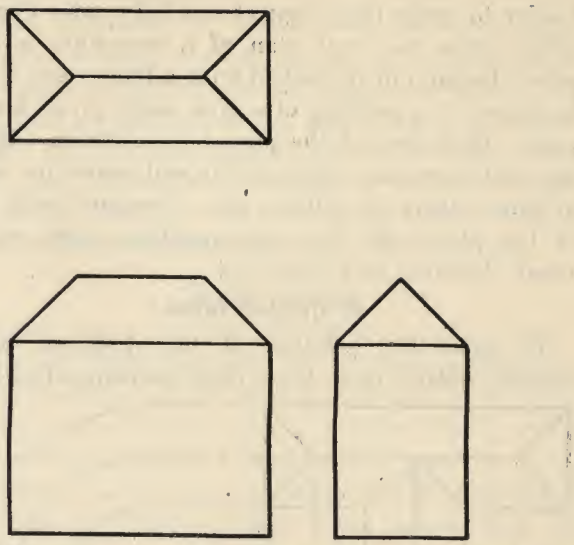


Fig. 24—Plan, elevation and side view of rectangular block with top beveled on four sides; resembles a house with hip roof.

the "East Elevation," etc. If the building occupies an entire square or block, or runs thru from street to street, the elevations may be marked "Main Street Elevation" or "Elevation on Main Street Side."

Sectional views thru different parts of the building are given, as these show the interior arrangement and structural framing, etc.

Working Drawings.

Before going further into the subject of working drawings for buildings, it will be best for the reader to have a thoro understanding of just what is meant by elevations, plans, etc.

Suppose we have a large rectangular block of stone, 2 feet long, 1 foot wide and 2 feet high. This would be represented in a working drawing, as in Fig. 21. The dimensions are marked on these drawings and later on these will be more fully explained.

The reader will have no difficulty in understanding this, as the plan gives the length and width; the front elevation gives the length the same as the plan, and also the height; the side elevation gives the width and the height. The three together show that every angle is a right angle, therefore this block would be a "parallelopipedon," which is the geometrical name applied to a regular solid figure whose six sides are all rectangular in form.

Importance of Careful Reading.

To show the importance of always looking at every view, suppose that one side of the stone block was beveled off for about a half of its depth, the working drawing in this case would be like Fig. 22. It would be noticed that the front elevation and plan is the same as that of Fig. 21, but the side view is different. Always examine every view and see that the dimensions on the one tallies with the corresponding dimensions of the other views.

A house of rectangular shape and a flat roof would be shown on a drawing like Fig. 21; if it had a lean-to roof, Fig. 22 would show its outline. For a house with a pitched roof and gables at each end, the plan, front elevation and side elevation would appear like Fig. 23.

If a hipped roof is used, the outline drawing would be like Fig. 24.

If the building is in the form of a T, having gables at its three ends, the drawing would be like Fig. 25.

Hips and Valleys.

If instead of gables the ends were hipped and the extension part the same height as the main part of the building, the drawing would be shown like Fig. 26. This figure shows the hips and valleys and gable ends quite plainly, and the writer would urge the

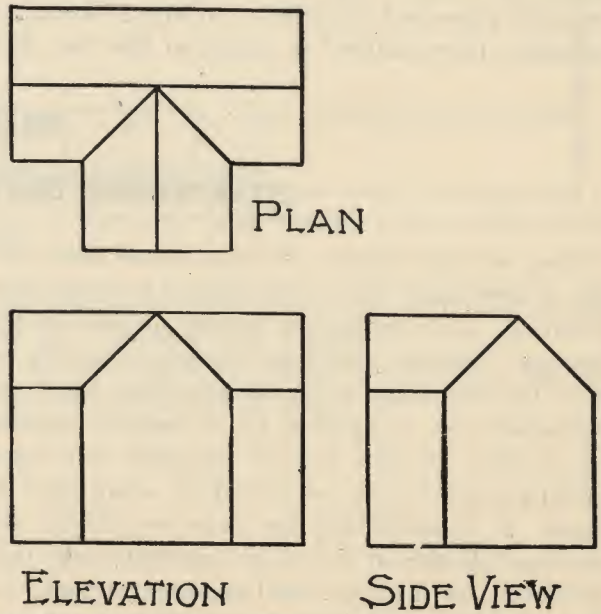


Fig. 25—Plan, elevation and side view of house with three gable ends.

reader to study these figures carefully; also Fig. 27, which gives the roof plan of a somewhat complicated design, but if studied with a little care, it will be found it is nothing else than made up of hipped ends. Each line of the plan represents an edge of the roof; some are edges at the end, some are edges at hips, others at valleys, etc. Compare each part of the plan with the corresponding parts on the front elevation and side view.

Projection Lines.

To show the relation of the different points clearly, dotted lines from each corresponding part

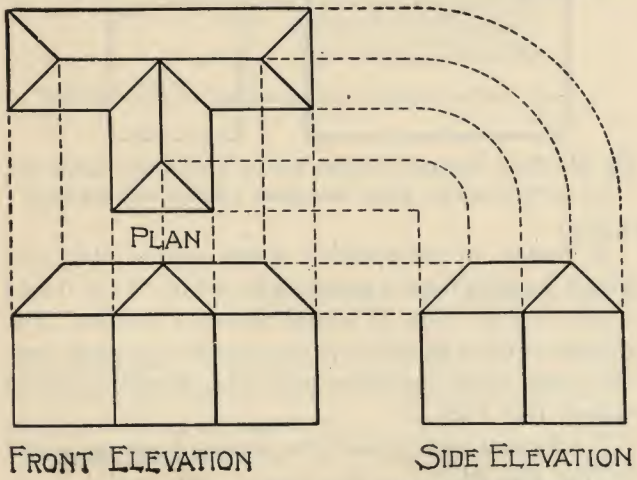


Fig. 26—Projection lines show relation of all parts.

on plan, elevation, and side view, have been drawn on Fig. 26. These dotted lines are called projection lines. By following the projection lines the reader should have no difficulty in recognizing each part on the different views. These projection lines are but seldom drawn but if you will imagine these lines on Fig. 27, or any other drawing you will have no difficulty in understanding the correct relation between the plans and elevations. In Fig. 27 draw the projection lines yourself in pencil so that you will

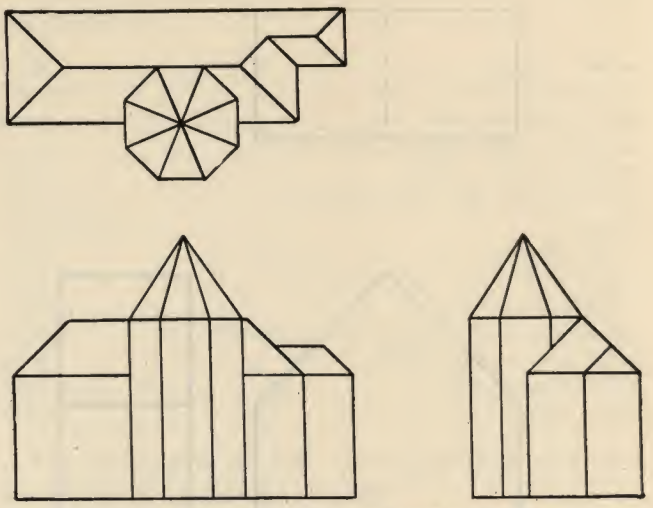


Fig. 27—A complicated roof design drawn without projection lines.

see clearly how each point on the plan corresponds with the same point on the elevations.

For simple objects, three views are usually sufficient, but in the case of a building, an elevation of each side usually is given, to show the arrangement of windows, siding, gables, etc. In cases where the sides are merely blank walls no side elevations are needed. This usually occurs with a loft building built in a city between two other high buildings.

Dimensions on Detail Drawings.

Besides the various plans, elevations and sections, detail drawings of every complicated part are given. Frequently detail drawings show every separate piece that is to be made. All these pieces should have their dimensions given, so that when the various parts are put together they will fit. When drawings are given in this way, the completed detail is also given, as it will show the workman how many of each separate piece are to be made to form the whole, and how they are to be put together.

CHAPTER V.

INTERPRETING DRAWINGS MADE TO SCALE

Every one can follow a drawing that is made full size, as they know that every piece of material is to be cut out to the exact size as that marked on the drawing. Full-size drawings, however, can only be given for very small parts; hence a foot has to be represented on a drawing by a distance smaller than a foot. In this manner the plan of a large building is placed on a comparatively small piece of paper. It is practically the same as making the drawing full size of the object wanted; only that six inches, for instance, shall represent a foot. In this case the drawing is made to half size, or drawn to a scale of six inches to the foot. The following table gives the names of the different scales in ordinary use:

12	inches	to the foot	= full size or scale
6	inches	to the foot	= half size or scale
3	inches	to the foot	= quarter size or scale
1½	inches	to the foot	= eighth size or scale
1	inch	to the foot	= one inch scale
¾	inch	to the foot	= three-quarter inch scale
½	inch	to the foot	= half inch scale
⅜	inch	to the foot	= three-eighth inch scale
¼	inch	to the foot	= quarter inch scale
3/16	inch	to the foot	= three-sixteenth inch scale
⅛	inch	to the foot	= eighth inch scale

From the above table it will be seen that if a certain dimension on a drawing measures 15¼ inches,

and the plan is drawn to a one-inch scale, the dimension is to be read as 15¼ feet, or 15 feet 3 inches.

If the plan is drawn to an eighth-inch scale, a line on the drawing measuring $9\frac{3}{32}$ inches would represent 72¾ feet, or 72 feet 9 inches.

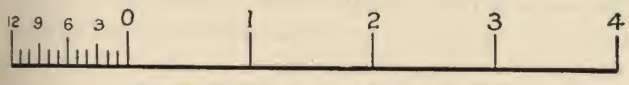


Fig. 28—A scale placed on a drawing.

Object of Drawing to Scale.

The whole object of drawing plans to scale, as stated before, is to enable the whole plan to be presented on a single sheet, as in this way the entire plan may be conveniently referred to. Usually, however, the building is so large that only one view can be given on a sheet of paper of convenient size. When this is the case, care should be taken while examining the drawings, so that a correct idea of the whole plan is obtained; this can only be had by referring from plans to elevations and sectional views, and vice versa.

dividers. No trouble will be met in reading the feet for any dimension, but how to read the inches might puzzle a number of readers, as the dimensions go backward. Suppose the dividers are set to the length of a certain line, and this distance is greater than 1 foot and less than 2 feet on the scale; then place one point of the dividers on the 1-foot mark, and the mark where the other point touches will be the number of inches, counting from the right.

"Scale" Rules.

There are a number of rules called "scales," which are made expressly for measuring drawings. These may be either flat or triangular in form. Another rule is now on the market which serves better for the needs of the mechanic than the scales mentioned, as it is an ordinary fourfold two-foot rule, but on its inner edges, which are beveled, the various scales are marked.

The marking on these scales is similar to the arrangement shown in Fig. 28. Fig. 29 shows the manner of using the scale. An inspection will show that the dimension of the lower line of the drawing is six feet nine inches long. After examining

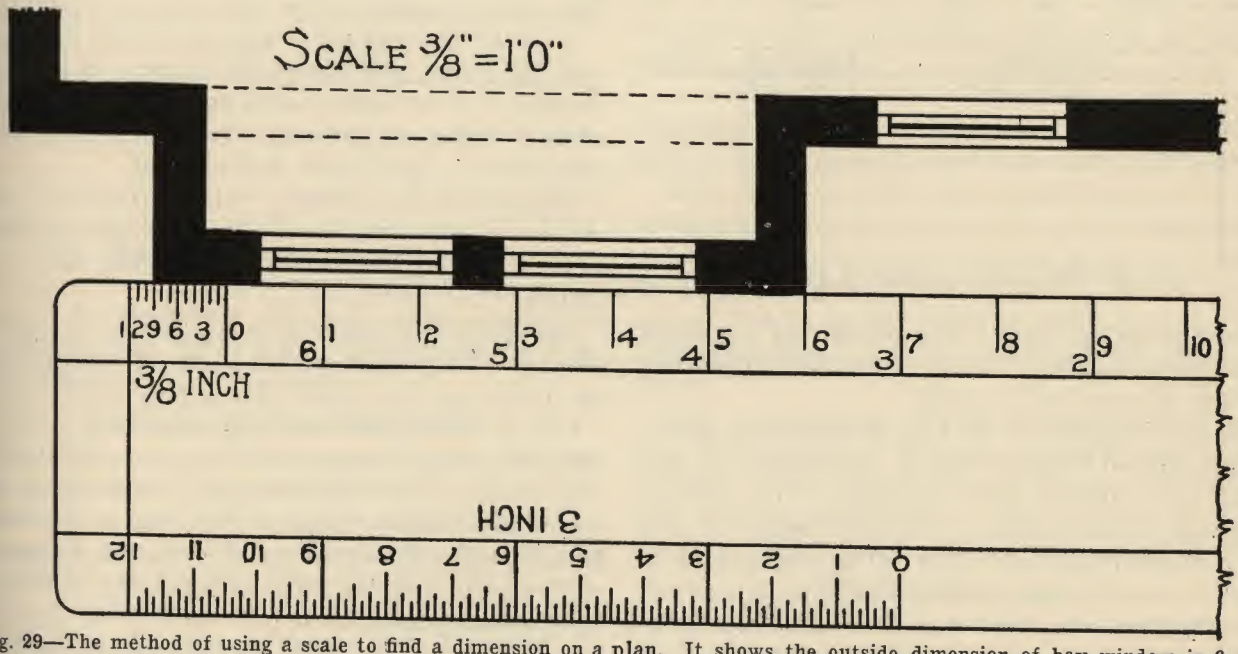


Fig. 29—The method of using a scale to find a dimension on a plan. It shows the outside dimension of bay window is 6 feet 9 inches.

The scale to which a drawing is made is nearly always stated on the drawing, or else a scale similar to Fig. 28 is drawn on the sheet, and all of the dimensions may be taken from this by means of the the figure, we think that no one will have any difficulty in reading from a scale.

In the majority of plans for buildings the scale ¼ inch to the foot is used.

CHAPTER VI.

HOW TO TAKE OFF DIMENSIONS

When trying to get a correct idea of the form shown by a drawing be sure to look at every view that is given, or you may fail to understand what is wanted. Carefully compare plans, elevations, both front and side, and sections, if they are given. Particular attention must be paid to the dimensions or sizes of the object.

While plans are drawn to scale and therefore can be measured they usually have marked on them a number of dimensions as a convenience in reading.

Foot and Inch Marks.

The mark ′ placed after a number means feet. The mark ″ means inches. Thus 14 feet 9 inches would be marked 14′ 9″. These marks are a sort of short-hand way of marking feet and inches. Sometimes these marks are not used, but the words are abbreviated thus: 14 ft. 9 in.

The most important part of reading dimensions is to know what points the dimension is taken between.

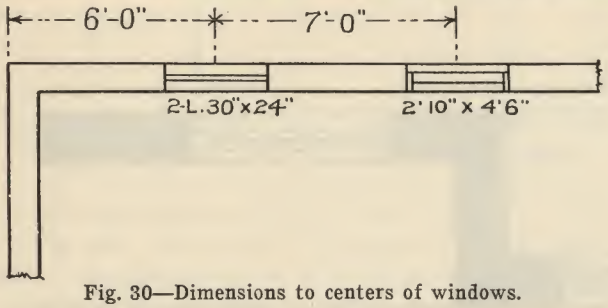


Fig. 30—Dimensions to centers of windows.

Arrow-points designate these points, but too much care cannot be taken to understand each dimension, so that no error may be made.

To avoid confusion, the line on which the dimension is marked is represented by long dashes, or very light lines; lighter than the lines of the regular drawing, so that there is a decided distinction and will, therefore, prevent their being mistaken for a part of the drawing: quite often these dimension lines, as they are called, are drawn in red or blue ink on the tracing, then when blue prints are made (as will be presently explained) these lines will appear fainter than the lines of the drawing.

Extension Lines.

Sometimes for lack of space the dimension line cannot be placed directly on that part of the drawing to be designated. In cases of this sort the dimension line is placed in a more convenient part of the drawing and short lines, called extension lines, are shown leading from the two points the dimension designates. Examine Figs. 30 and 31 and particularly Fig. 35 as in this drawing the value of extension lines is clearly shown. All the outside dimensions are here placed on one line, where they are easily read and checked up. Sometimes the dimension arrows are placed on projection lines, etc. Take particular care to notice where the arrows are placed.

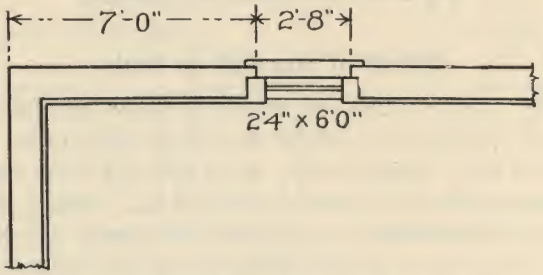


Fig. 31—Dimensions to window openings.

Dotted and Center Lines.

As has already been mentioned, dotted lines may show the arrangement of some interior part or section. Do not confuse these with the dimension lines.

A center line consists of a dot and dash line, or a very light line, and shows the centers of a room, window or door frame, porch columns, etc. In the cases of circles and rectangles two center lines cross each other at right angles at the center.

Dimensions for columns, balusters, studs, joist, etc., are nearly always made from center to center, as these articles are usually set so many inches on centers.

Sometimes the center lines are drawn in red or blue ink. To prevent confusion, the dimension lines are in blue and the center lines in red, or vice versa.

Fig. 30 shows how center lines are used to designate just where the two windows are to be placed; the mechanic can easily measure to determine the center of a window frame, in this case at a point 6 feet from the left corner of the building, as shown on the plan, and the window then will be in the exact position planned by the architect.

Center lines give a ready means of measuring that mechanics can easily follow with the least likelihood of making mistakes. Some architects give the di-

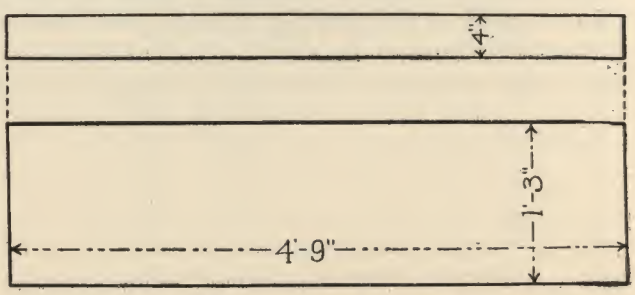


Fig. 32—How dimensions are given inside.

mensions to the center of window and door openings, so as to insure their being set in the proper place; others give the dimensions to openings of sizes of doors, sash or glass; see Fig. 31 for illustration.

Watch the Small Fractions.

A little thing like 1/16 or 1/8 of an inch is small in itself, but taken a few times it makes quite a difference in the interior arrangements of a house. Sometimes, where a full width of casing was planned, incorrect placing of the openings leaves only room for half a width. Working from centers will avoid mistakes of this kind.

Fig. 32 shows a board 4′ 9″ long, 1′ 3″ wide and 4″ thick. The dimension lines are placed inside of the drawing. Frequently they are placed outside, as shown in Fig. 33. The thickness of the board is drawn so small that there is hardly room for the dimension to be marked clearly in the space; when such is the case, an arrow leads from the space to some space on the paper where the dimension can be clearly marked.

Particular care should be taken in reading dimensions that are marked with the signs ′ and ″. Fre-

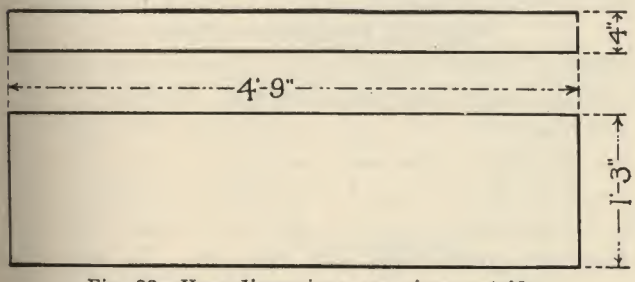


Fig. 33—How dimensions are given outside.

quently the draftsman will only make one stroke instead of two. If you are in doubt about a dimension, measure it with the scale.

Custom in Marking Dimensions.

The usual custom is to state the inches as inches and not parts of a foot, thus 6″, not ½′. On dimensions over a foot it is customary to state both the feet and inches, even if it is an exact number of feet, by stating 0 inches thus: 6′ 0″ means six feet. The idea here is to prevent any misunderstanding, as the 6′ may be hurriedly read as 6″; but, when both the feet and inches are given in this manner a mistake is hardly possible.

Different Methods of Marking Dimensions.

Fig. 34 shows three different ways of placing dimensions between two walls; particular attention should be paid to the position of the arrow-heads: the top dimension of 8 feet is the distance between the inside edges of the walls, the middle dimension of 8½ feet is the distance between the centers of the two walls, while the lower dimension of 9 feet is the distance between the outsides of the walls. Particular attention should be paid to the position of the

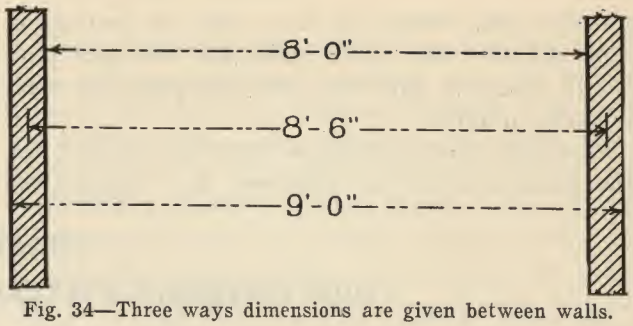


Fig. 34—Three ways dimensions are given between walls.

arrow-points. Sometimes, thru error or oversight, the draftsman will place one arrow-point on the inner surface of the wall and the other arrow-point on the outer surface of the wall. This will lead to some doubt as to what is meant, but in cases of this kind the scale comes in handy, as by means of it the drawing may be measured, and this will show where the arrow-point should have been placed, as the figures will usually be correct. It will be best, however, before starting the job, to check over the figures to see that they tally.

Correct Sectional and Overall Measurements.

To explain this thoroly we will refer to the portion of a plan, Fig. 35. Reading from left to right we have for the inside measurements, plus the thickness of the walls:

$$6'' + 10' + 6'' + 7'\ 6'' + 6'' = 19'$$

Checking these inside dimensions with the outside dimensions we have: $2' + 2' + 3' + 2' + 10' = 19'$.

If by checking up in this manner the total of the inside dimensions is not the same as the total of the outside dimensions, something is wrong, and the drawing should be carefully gone over to find the error. This is done by using the scale and checking each dimension until the one which is wrong is found.

It is usual on plans to have an "over-all" dimension, thus in Fig. 35 the end extension lines would be longer than the others and the over-all dimension of 19 feet marked on it. See the regular working plans shown further on for illustrations of this.

Checking Dimension.

Dimensions should be carefully checked, both for the length as well as the breadth of the plan. The

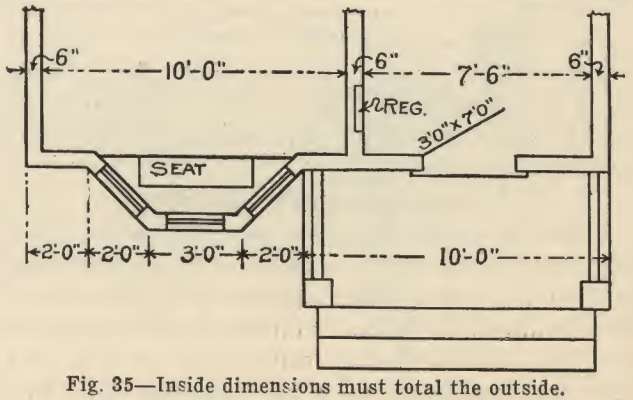


Fig. 35—Inside dimensions must total the outside.

first floor plan should check up with the foundation plan and the other floor plans and the roof plan should check up with the first floor plan—all must be made to agree.

Particular pains should be taken in checking the dimension to centers of windows, etc.: examine the elevation and if it shows that one window is directly over the one below it, be sure that the dimension to the windows are the same on all the plans. If they are given to the centers of the windows or doorways, be sure that each dimension on the different plans is the same.

CHAPTER VII.

HOW DIFFERENT FIXTURES ARE SHOWN ON A PLAN

Enough has been explained in previous chapters to enable us to take up a small plan as an example. Of course there are quite a number of symbols, devices, notes, etc., that appear on plans and which have not been explained but they will be taken up later.

In the majority of cases the plan given out and worked from is not an original drawing but a copy of same, usually by the blue print process. The architect when he makes his original drawing makes it on transparent paper or cloth and these are used to make the blue print copies.

Blue Prints.

Blue prints are copies of drawings made by a process somewhat like photographic printing. They are now used almost exclusively in place of the original drawings, which are thereby kept unsoiled for future reference.

The blue prints are made either on strong paper or cloth. Paper prints that are to receive a good deal of handling are sometimes mounted on a piece of wood or stout cardboard. The blue-print may be pasted down on the board, care being taken that all wrinkles and blisters are smoothed out. After it is dry it may receive one or two coats of thin shellac so that it will spread easily over the surface of the blue print.

Corrections may be made in lead-pencil or ink—white ink is used frequently, or, if this is not liked, a saturated solution of washing soda and water may be used. The latter will make a white line, as it removes the blue from the print.

By a saturated solution is meant that soda is put into water until no more will dissolve—that is, the extra soda lies at the bottom of the vessel without dissolving.

Blue prints are frequently colored by means of water-colors or colored crayon pencils; the coloring of each section indicating a certain material to be used in the construction. The meaning of the colors has been explained.

A Suggestion on Plan Reading.

Probably the quickest way to read a set of plans is to separate the different sheets and then seat yourself before a table placed against the wall; tack all the elevations on the wall and lay the floor plans on the table, foundation or cellar plan on top, first floor next, and so on up to the roof plan. See Fig. 36. This arrangement will enable you to see the relation of all parts, and by means of a rule or any straight edge, you can measure down from the elevation and across to the part of the plan from which the projection is taken. This will answer the same as if the projection lines were drawn and the entire plan shown on one sheet. You must take into account the existence of the lines—if not shown imagine they exist. In this way you will have no trouble in getting a correct idea of the roof from the plan and the elevations, this is a very important part in plan reading.

Having explained the necessary A B C's of drawing, the next step is the study of a plan of a house.

Value of Perspective Views.

Fig. 37 shows a picture or a perspective view of a small 4-room and bath shingled bungalow. Suppose that the entire upper part above the middle of the windows in the first story is cut away, then all the rooms can be seen if one is looking directly down on the uncovered portion; also every stud, doorway, sheathing, plastering, etc. Fig. 38. To show all these various parts on the drawing is unnecessary, as when any practical builder receives the plans of a frame house, he knows that all the walls are to consist of studding, lath, plaster, sheathing, shingles, etc. Besides, no plan is given without a specification which describes the different materials to be used in the building.

Conventional Wall Lines.

To represent the walls of a house, a common method is to draw one heavy line to represent both the inner side of a wall and the outer side of the house. The same is also true of inside partitions.

Another method, one most frequently used for drawings made to a scale of quarter inch to the foot, is to use two lines, one to represent the outer, the other the inner edge of a wall or partition. Examples of this will be seen in the complete sets of plans given further on.

An examination of Figure 38 will make the above clear. This figure represents the first story of the house, or in the case of a bungalow or one story house, we simply say "Floor Plan." Of course there will probably be cellar plans, also attic and roof plans. The reader should compare these with Fig. 38 and note the positions of the various windows and doors on the plans.

Interpreting Plans.

Beginning at the bottom of Fig. 38 you will notice two squares with smaller solid black squares in them—now look carefully at Fig. 37, which shows that there are porch piers with columns on top—and of course we instantly recognize the two horizontal lines between these squares as the railing between; a similar railing also is shown between the right porch piers and the front of the house. No one can mistake the large rectangular space for anything but a porch, even if it were not so marked. At the left of the porch there will be noticed six long rectangles; these of course will be easily understood to be the porch steps as will be plainly seen by looking at the picture.

Next comes the heavy solid line that represents the shingles, sheathing, studding, etc. It will be noticed that this line is not solid thruout. Towards the left are three spaces, these are left white, being simply joined by light lines at top and bottom: this represents a window. A little further to the right is another blank space, the middle section of which has a light line (at an angle) at the top of the space, and at the bottom is a light line, at each side are windows and of course we see from the picture that this is a door with side lights. The threshold of an outside doorway is always above the floor of the porch, and it extends a slight distance outside of the walls of the house; this is the reason that the line representing the door and side lights is drawn

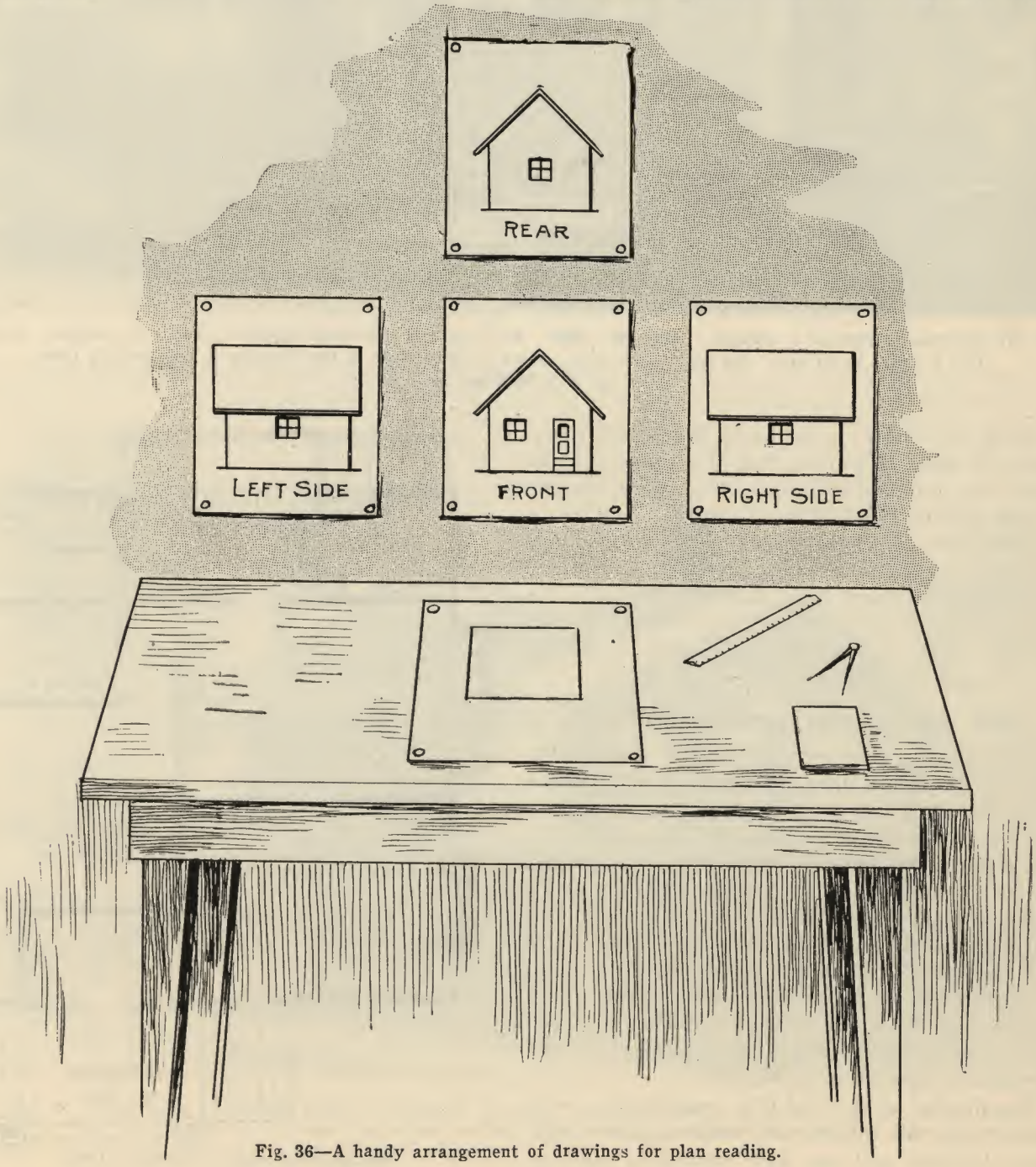


Fig. 36—A handy arrangement of drawings for plan reading.

Fig. 37—Perspective view of a cottage. Design No. 6640. An attractive four-room bungalow sided with shingles. Size 29 feet 6 inches by 31 feet. We can furnish blue printed working plans of this building to any desiring them for only $5.00 per set.

beneath (or outside) of the heavy line (which represents the wall). The inner line of the door is at an angle, this represents the way the door swings, the hinges or butts being on that side.

These lines are drawn to scale as well as the other parts of the plan, as it is necessary to do so in order to get the proper size of the door that will go in the given space. It may be stated here that the sizes of the doors, etc., are marked on the plans as will be explained and illustrated further on.

How Windows and Doors Are Indicated.

Now, tracing the heavy black line around the house a number of openings will be noticed; these the reader will have no difficulty in understanding are windows and doors at the rear; there is no rear porch but a grade entry. At the left are steps and a platform which is marked "icing platform," this will be explained directly.

The reader will have observed that the wall line has two breaks on the left side from the straight rectangular form; these being made to show that a chimney and bay-window were desired. This will all be made perfectly clear by an examination of the perspective view given in Fig. 37.

The interior of the first floor consists of a vestibule, living room, dining room, kitchen, pantry, bathroom, bedroom and rear hall, divided by walls or

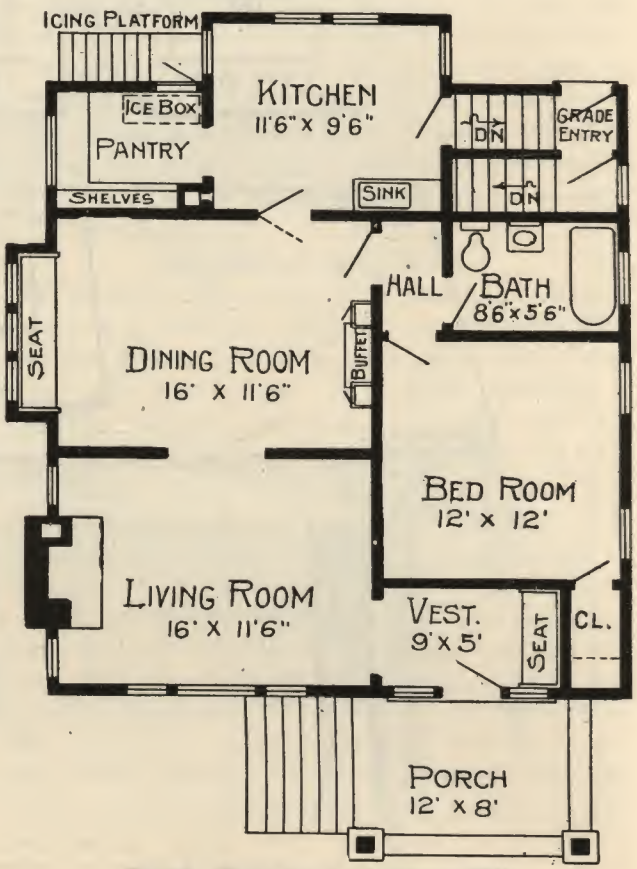


Fig. 38—Floor plan for bungalow 6640.

partitions which are indicated by a heavy line, the same as the outside walls. Doorways lead from the hall into the dining room, bedroom and bathroom, the doors swing as indicated. It will be noticed that no door is indicated between the vestibule and living room, this is taken to be a cased opening, also the same between the living room and dining room.

There is a fireplace in the living room. The door between the kitchen and dining room shows double, this means that this is a double swinging door—that is, it swings into both rooms. The kitchen has its own chimney, and there is simply a flue opening—there is no range or hearth indicated; if these were desired they would have been indicated as described later. (Fee Fig. 38.)

In the Kitchen.

In one corner of the kitchen a sink with drainboard is indicated. In the pantry shelves on two sides are wanted, and there is a dotted rectangle with two diagonals which indicates (as it is marked) that it is space left for an ice-box. A door is also shown in the wall in back of the ice-box, this indicates that it is a small door thru which the ice is placed directly in the ice-box without the iceman having to come into the house, to enable this to be done it is of course necessary to have steps leading up to the door and for standing space a platform on top is required—all this is shown.

In the dining room a buffet is indicated at the side. Two doors are shown crossing two parallel lines: this indicates, as the reader has no doubt surmised, a china closet on each side, the first or inner line indicating the width of the shelving and the other line shows the outside of the closet.

Stairways.

Towards the right of the kitchen is a door, and on it is marked DN and an arrow on a number of rectangles. This means that there is a stairway leading down from the kitchen to the grade entry, that is to say an entrance even with the ground. The arrow indicates the direction in which the stairs run from the level. The plan illustrates, in this case, the first floor. At the level of the grade entry another stairway and DN is shown, which means that this is the cellar stairs.

In the vestibule and dining room the bay window seats are to be placed—they are simply marked—observe that at the sides and back there is a line just inside of the wall line, this indicates that there are sides and a back to the window seat, probably paneled (this must be found out from the details

Fig. 39. Perspective of another study in bungalow building. Design No. 6632. A pretty bungalow of five rooms, 26 feet by 38 feet 6 inches. We can furnish blueprinted working plans of this building to any desiring them for only $5.00 per set.

(or specifications), however we know it is more than a board set in between the walls.

In the bedroom closet the line denotes that a shelf is placed toward the front.

The Bath.

The bathroom is practically self-explanatory—no one can mistake the fixtures. Reading the plan from left to right, first is the water closet, then the wash basin with a medicine closet above it, and the bathtub is against the outer wall.

So far a few of the important points about plan reading have been explained without any reference

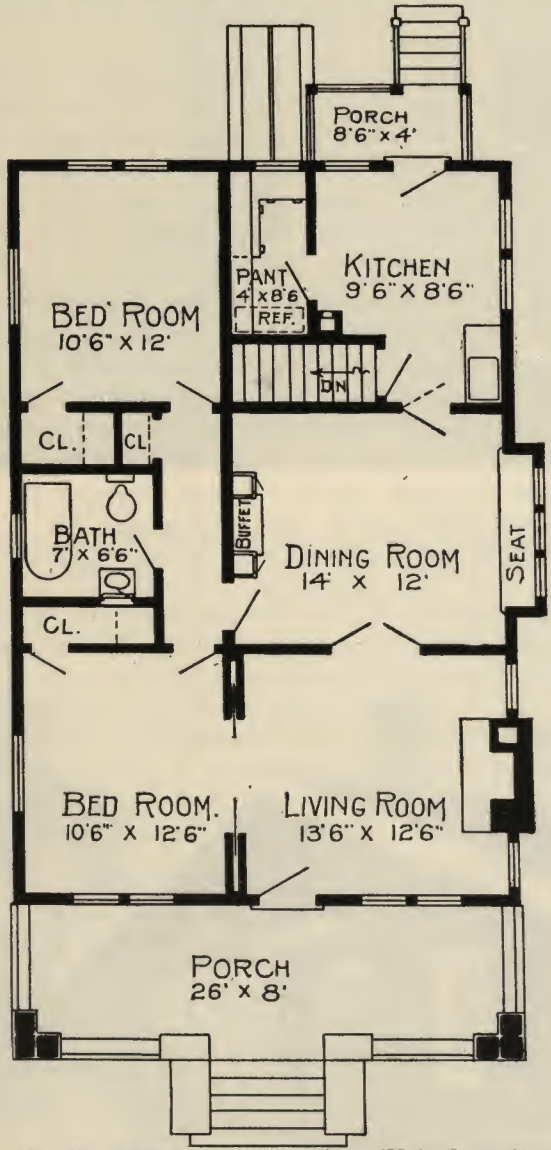


Fig. 40—A study in plan reading. (Main floor plan design No. 6632.)

to an actual set of working drawings, and before taking that up it will be necessary to study a few more designs, so as to get a good idea of the various devices used to indicate the many parts of a house.

Reading a Perspective.

Fig. 39 gives a perspective and Fig. 40 the floor plan, of another bungalow on which some details are different.

First note that on the sides of the porch steps there are shingled bulkheads and above these on the porch are two wide shingled newels that correspond with the bases of the columns on the corners.

Between the living room and bedroom, the opening shown consists of two sliding doors in pockets between the partition. Nothing further regarding the interior needs explanation.

At the rear of the house there is a porch; the three small black squares may either indicate small porch columns or only newels, a side view or rear elevation is necessary to make sure of this, at the bottom of the steps the small squares indicate newels. Towards the left of the porch the various horizontal lines indicate the cover or doors over the outside stairs to the cellar. Beginning at the first two lines to the left, these show the masonry sidewall or bulkhead, from the second line to the middle double line one door or cover is shown—the double line indicates the small batten strip or astragal put on to cover the crack between the two doors; of course the other half is the same and requires no further comment.

Particulars of a House Plan.

Fig. 41 shows a perspective view and Fig. 42 the floor plans of a seven room concrete block house.

It will be noticed that the lines indicating the outside wall are much thicker than the inside walls —this is due to the walls being of concrete blocks, that is 8 inches thick plus the thickness of furring, lath and plaster.

Beginning at the bottom of Fig. 42 (the first floor plan) there are bulkheads at each side of the steps. At the outer ends of the porch there are three small squares with black circles in them which indicate round columns on a square base, as shown in Fig. 41.

Two small squares are shown at the sides of the steps, these are newels connected to the columns by a short railing. There is a different way of denoting a cased opening on the plan,—by means of dotted lines as shown between dining room and living room. There is also a cased opening between living room and hall, but at each end of the opening a small rectangle with a small circle is shown in it; these represent columns, with pedestals or bases; in other words it denotes a colonnade opening similar to Fig. 43.

Stairway Details.

The small rectangles at back of reception hall, Fig. 42, indicate a stairway to second floor and the arrow shows that the stairs go up from the first floor level. From the kitchen a short flight of stairs also goes down to the grade entry.

At the line representing the second riser there is a small square with diagonals. This represents the newel and the lines from the newel to the walls represent the hand rail; note particularly that there is a slight extension from the wall. This denotes that a half newel is placed there for the hand rail to

Fig. 41—Perspective of a concrete block residence of seven rooms. Two and a half stories and basement. Design No. 6564. We can furnish blue printed working plans of this building to any desiring them for only $10.00 per set.

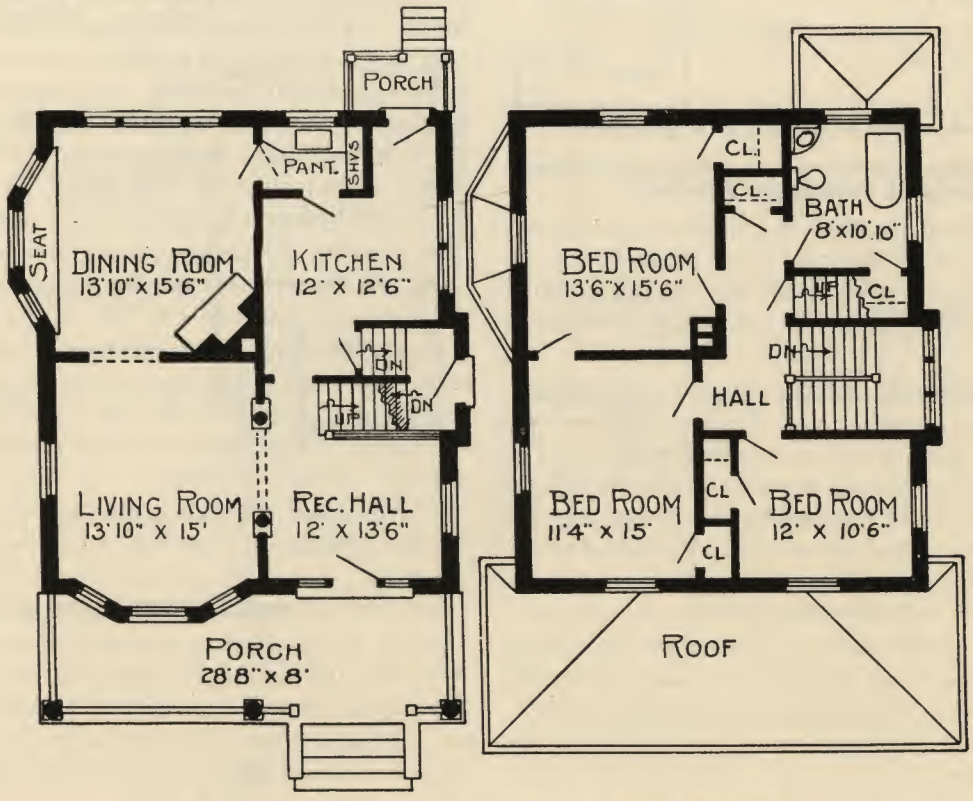


Fig. 42—Floor plans of concrete block residence, No. 6564.

finish against. Note the jagged cross line across the steps, this is used to indicate that some part of the drawing which should appear (the upper portion of the stairs to the second floor) is omitted, so as to show some other part that is under it (in this case the stairs to the cellar).

On the second floor plan, shown on Fig. 42, the attic stairs are broken off in a like manner to show the closet under the stairs. Note, also, that there is a platform. This, of course, is below the level of the second floor, but higher than the first, and as the cellar stairs were shown on that plan the platform is shown on the second floor plan. Observe that a handrail starts from a newel on the platform and then a newel at the top of the stairs and then a short length of handrail ending at a half newel against the wall, this shows an open well hole. Nearly all the steps would be seen by looking down from the second floor level, but this has not been done in this particular case as the draftsman evidently thought it unnecessary.

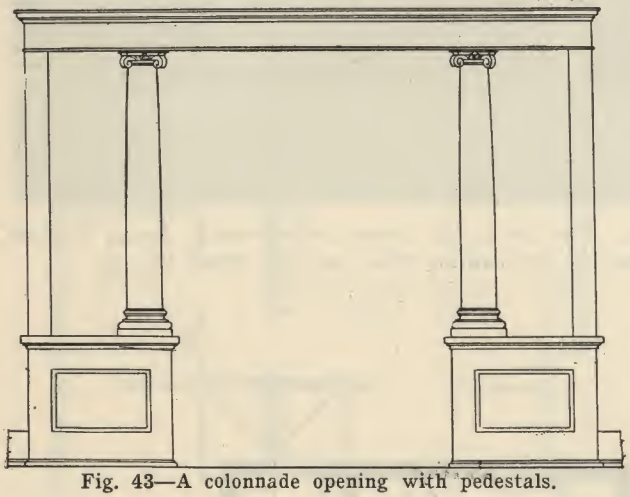


Fig. 43—A colonnade opening with pedestals.

Methods of Indicating Windows.

Note on both plans that the windows are shown in a different way than on Figs. 38 and 40; the three inner lines representing the windows, which are set back, and the first line indicating the window sill.

In Fig. 42—second floor plan—the roof of the front and rear porches, also the bay window, are shown. The front porch is the full width of the house, the cornice extends beyond the side walls, and to make a neat finish the cornice is returned against the walls of the house and a small hip placed there. The double line at the outer edge of the roof indicates a gutter.

Figs. 44, 45 and 46 show a design of another house about which there are several new points that will help the reader to understand how to read a plan.

In Fig. 45 the windows are shown as before but quite a number of them have slanting line from one corner, practically the same as a door is represented. This arrangement represents casement windows, that is single sash windows hinged at one side. As the lines indicate the windows swing in.

Showing a Beamed Ceiling.

In the living room a number of double dotted lines are shown. These represent the design of a beam ceiling overhead, the same is true also in the dining room. Note that a single dotted line goes all around the room, this represents the half beam against the wall.

Between the living room and dining room there is a colonnade opening and this is shown by dotted lines also, this makes a series of four dotted lines and one must be careful in cases like this to be sure just what each line is supposed to represent. Just a little thinking and tracing out the different lines, taking them one by one, will enable one to get the right idea.

In the rear chamber leading out to the screened porch a double door is represented, this is taken to mean a French window, that is a pair of casement sash extending to the floor—the design of course would be shown on the rear elevation or on the details.

Nothing further on the first floor plan needs any particular attention as the different features have been previously described.

On the Second Floor.

Turning now to the second floor plan, Fig. 46, it will be noted that the outline or outside walls of the second floor do not continue around solid to form the rectangle but certain parts at the corners are dotted. At these dotted sections the roof is shown in plan and broken off by a jagged line, with the valley rafters indicated thereon. The reason for this will be clear if you will examine Fig. 44, which shows there is but little space available at the corners, owing to the slant of the roof. To indicate this many draftsmen sometimes even omit the dotted lines showing the outline of the floor below and just break off the wall line for the unfinished portions of the house as shown in Fig. 47. The reason for this is that some workmen would be apt to read the plan incorrectly and think that a wall of studs, etc., was to extend all around. An examination of the front elevations of the regular working drawings would, however, remove all doubt. Often in cases like this the rooms cannot be full height all over, there might be some slant to the ceiling at one or more sides of the room.

Indicating Furniture.

Every house should be planned so there will be room for the necessary furniture and if the plans were prepared by an experienced architect this matter will have been properly taken care of. Now a bedroom should contain the necessary wall space for placing a bed, dresser, etc.

Fig 44—Perspective of a seven-room bungalow. Size, 33 feet 6 inches by 47 feet. Siding is of wide boards; foundation courses and porch pillars brick. We can furnish blue printed working plans of this building to any desiring them for only $6.00 per set. Design No. 6541.

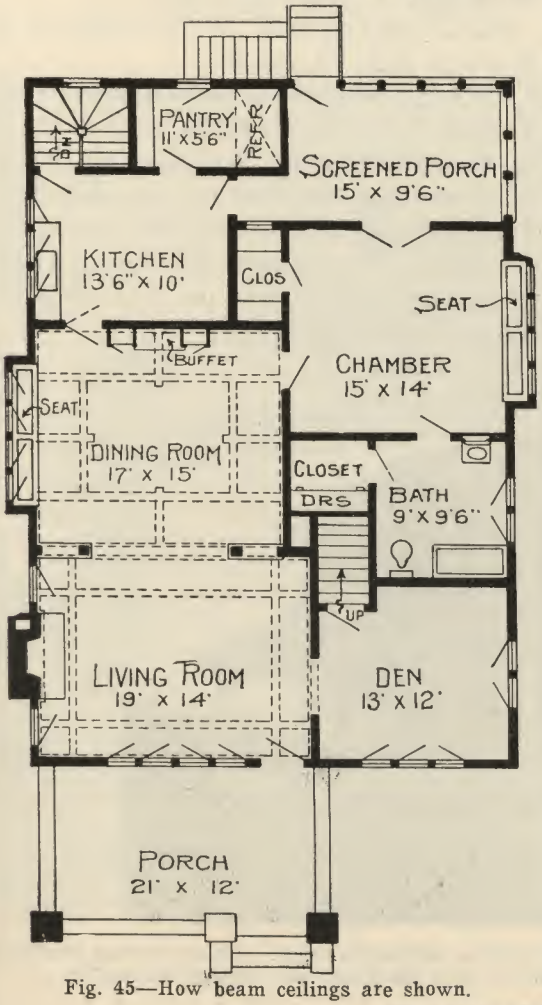


Fig. 45—How beam ceilings are shown.

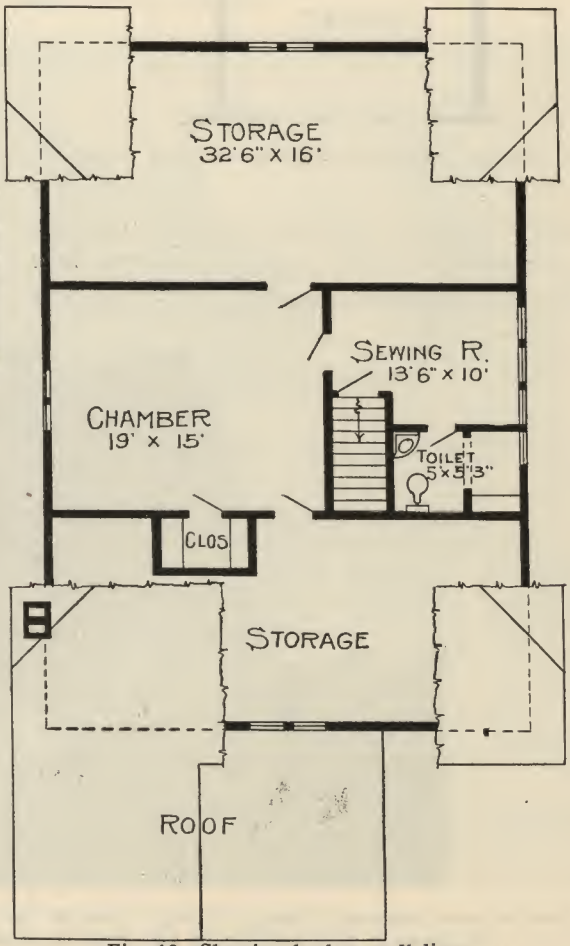


Fig. 46—Showing broken wall lines.

Floor plans of bungalow No. 6541.

Architects frequently show on the plans the location of furniture, but this has nothing to do with the construction of the building. If you receive a plan with the furniture layout indicated simply ignore it but be careful to follow dimensions or scale so that there will be the necessary room allowed for the pieces of furniture the plans call for.

An example of this will be seen in Figs. 49 and 50. Here spaces are marked on the plan to mean that some particular piece of furniture has been planned

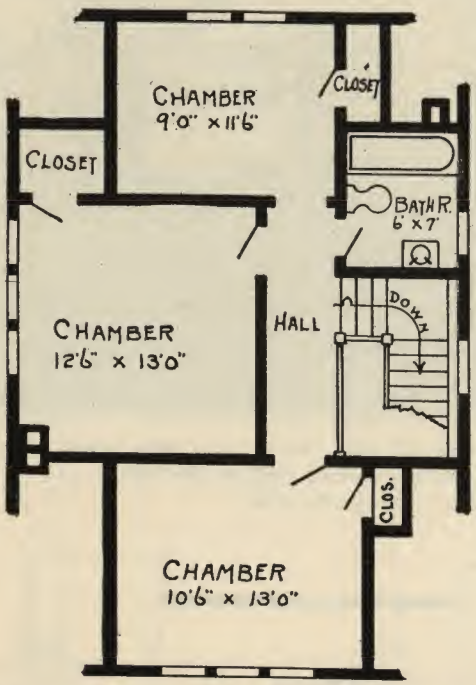


Fig. 47. Another method of showing wall lines broken.

to go there. Starting with Fig. 49 and entering the living room from the porch, there is an arm chair shown on each side of the doorway, in the center is a small table with four small chairs, towards the right is a sofa or davenport; at the rear, by the stairway wall, is a piano and stool, while two small chairs are placed on the left side wall between the colonnade opening and the door to the kitchen.

No mistake can be made regarding the dining room furniture: a round table is shown with a number of chairs around it and two spare chairs in the corners.

On the second floor plan, Fig. 50, the chairs are indicated the same as on the first floor; the large rectangles with the diagonals represent beds and the smaller ones dressers or chiffoniers.

How Perspectives Are Shown.

A perspective drawing is very seldom submitted to the workman, but for the sake of instruction it may be stated that there are two ways of showing a perspective—it is either rendered in wash or in line. Fig. 51 shows a perspective of a house that has been rendered in wash; that is to say, it is a regular water-color painting, which may be painted or "washed in" in black, brown or different colors. Fig. 52 shows the same design in line rendering, which may be done either in pencil or ink. (The perspective illustrating the complete set of working drawings is an example of wash rendering.)

Figs. 53 and 54 show the floor plans of the house as seen in Figs. 51 and 52.

The object of showing the perspective views of the different houses is to train the mind of the reader to see the relation of the complete house to the plans and elevations. When this is accomplished the reader will be able to form a complete mental picture of how the house is going to look from a study of the plans and elevations; and this is the key to the correct reading of plans.

Fig. 48. Perspective of six-room shingled cottage. Size, 25 feet wide by 22 feet in depth. We can furnish blueprinted working plans of this building to any desiring them for only $8.00 per set. Design No. 6677.

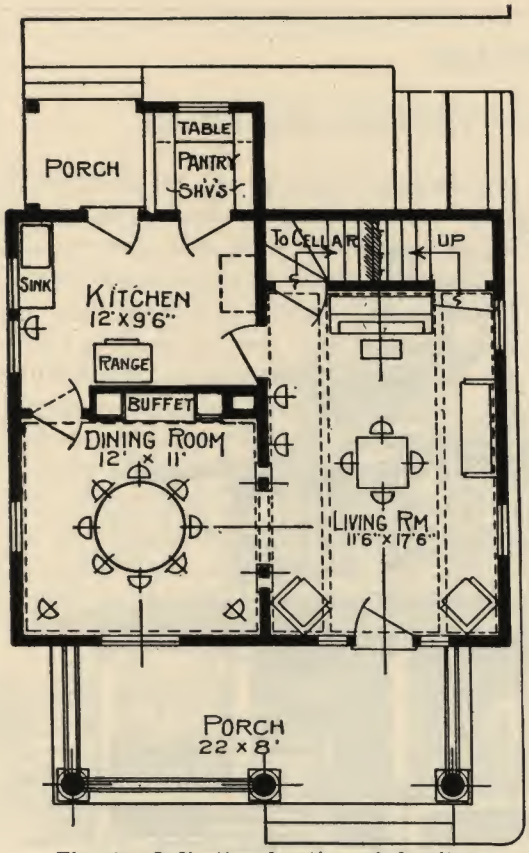


Fig. 49—Indicating location of furniture.

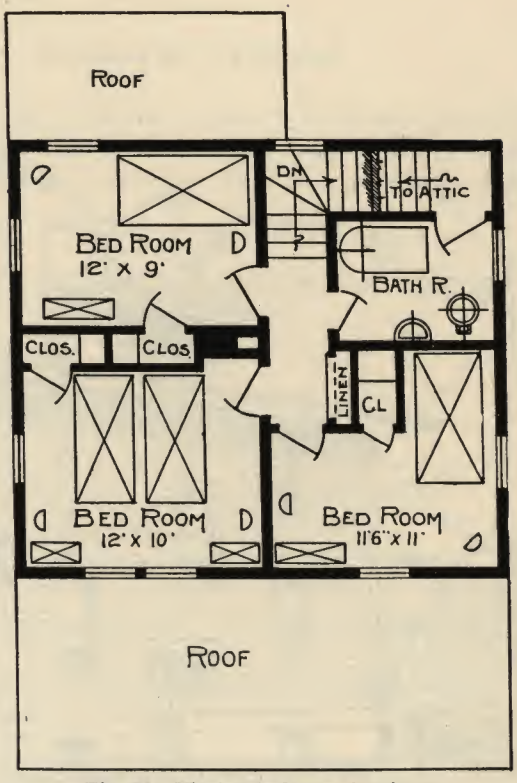


Fig. 50—Placing bedroom furniture.

First and second floor plans for design No. 6677.

Fig. 51—A perspective shown in wash drawing. A very economical house to build. Eight-room, frame construction, hip-roof design. Size, 26 by 36 feet 6 inches. Design No. 6554. We can furnish blue printed working plans of this building to any desiring them for only $8.00 per set.

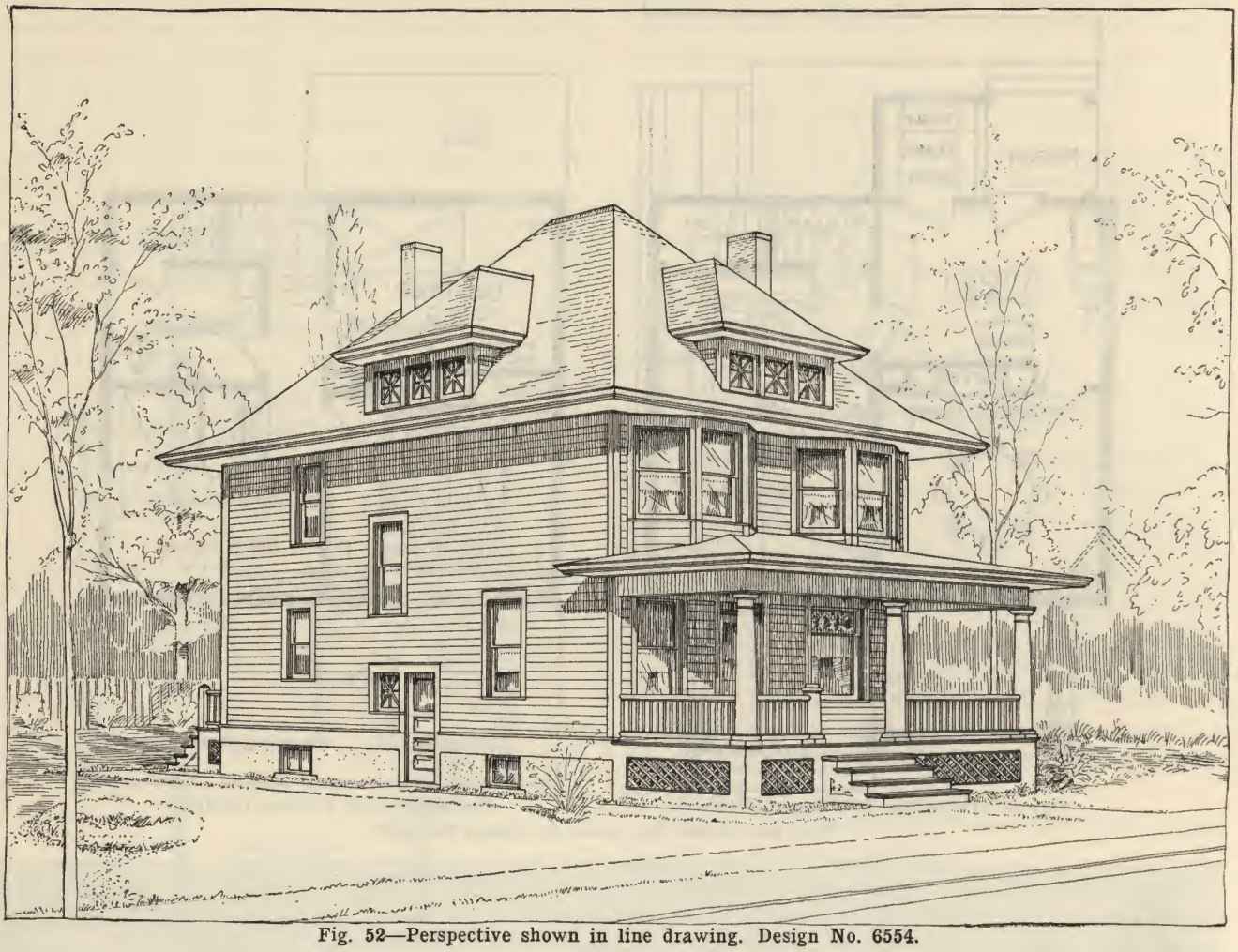


Fig. 52—Perspective shown in line drawing. Design No. 6554.

Fig. 53—First floor plan.

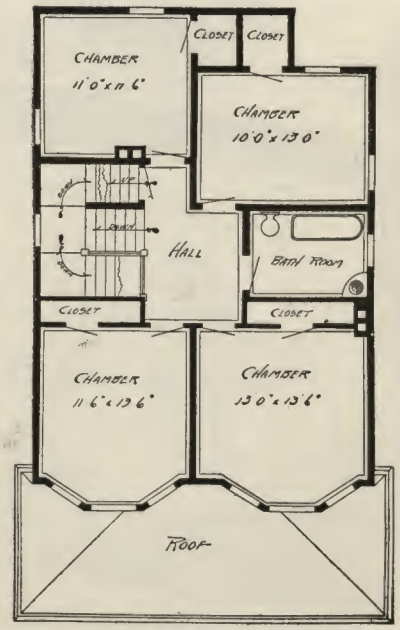


Fig. 54—Second floor plan.

Arrangement of economical eight-room house (design No. 6554). Size 26 by 36 feet 6 inches.

CHAPTER VIII.

FRAME AND MASONRY WALLS—STANDARD SYMBOLS

In the descriptions of the previous illustrations were explained the method of showing the various parts or arrangements that go to make up a house. There are many other means of showing parts and arrangement, and these are called "conventional methods"; that is, they are not true drawings but only a simplified way of designating them; or, we may say, they are a sort of shorthand sketch. No matter how they are drawn, as long as they convey the true meaning of the architect to the workman they accomplish their purpose. They are so simple, however, and so plain that they will suggest themselves to the student in nearly every case.

Thus when in the plan of the kitchen an arrangement like Fig. 55 is shown, almost everyone can understand that A represents the chimney, B the hearth, C the range, D the boiler, E the drainboard, F the sink, G the washtubs, H the dumb waiter, I a pantry with shelves; J represents another method of showing a door, and how it should be swung; the light line represents the arc made by opening the door. The dimensions of the door are frequently marked on the plans as shown at J; this means that the door is 2 feet 6 inches wide, 7 feet high and 1⅜ inch thick.

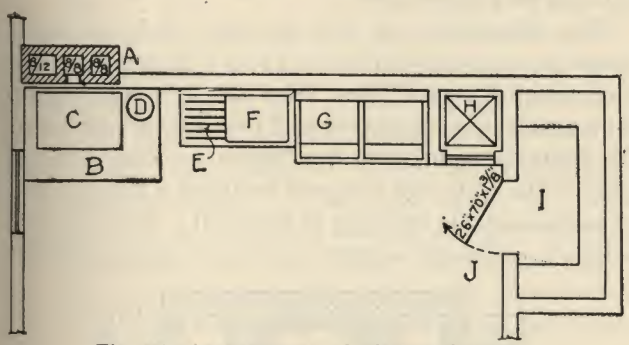


Fig. 55—Arrangement of kitchen fixtures.

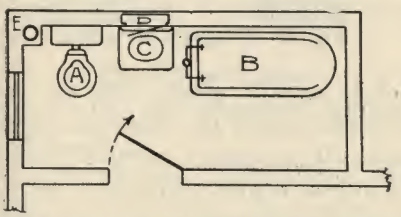


Fig. 56—Showing location of bath fixtures.

Bathroom Fixtures Shown.

In a bathroom plan, like Fig. 56, it is very clear that A is the water closet, B the bathtub, C the wash basin, D the medicine cabinet, and E the soil pipe. To find out what kind of a bath, closet, basin, etc., is to be put in, refer to the specifications.

Fig. 57 shows a room with three openings and a bay window. The double dotted line at A represents an arched opening; this will generally be marked "arched"; B is an opening with sliding doors, or folding doors as they are sometimes called; C is a plain cased opening; D an ornamental grille opening with columns and arch or beam, at the left a column starting at the floor is meant and at the right a column on a pedestal is meant.

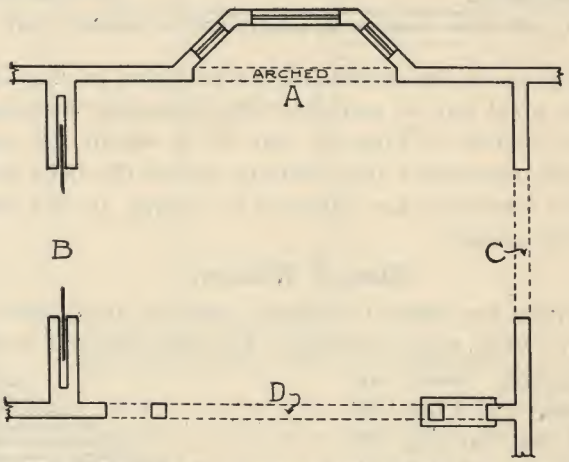


Fig. 57—Arched, cased, colonnade and sliding door openings shown.

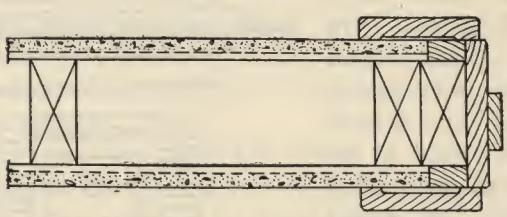


Fig. 58—Section of wall showing studs.

Studding Detail.

On detail drawings where sections or parts of studding are shown, they are frequently represented by a small rectangle with diagonal lines crossing each

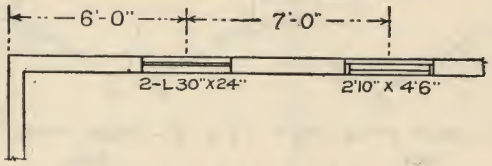


Fig. 59—How a frame wall is shown.

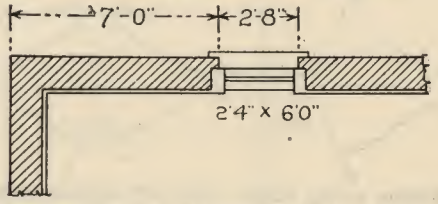


Fig. 60—How a masonry wall is shown.

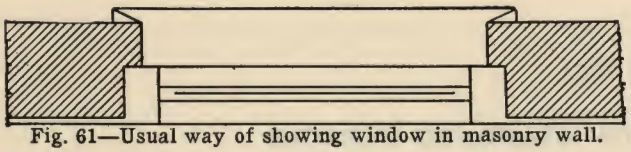


Fig. 61—Usual way of showing window in masonry wall.

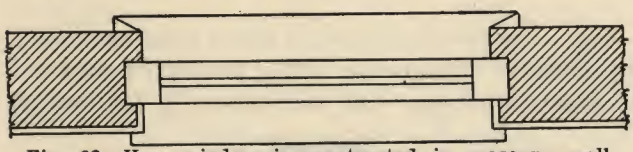


Fig. 62—How window is constructed in masonry wall.

other, as in the section of the partition in Fig. 58. This must not be confused with a similar arrangement shown in Figs. 49 and 50, in which the rectangle represents the positions which the beds and other furniture are planned to occupy in the different rooms.

Sizes of Windows.

There are several methods used by architects to show walls with windows. The two methods most commonly used are shown in Figs. 59 and 60. In Fig. 59 a portion of a frame wall is given; here the dimensions are given to the centers of the windows. There are several different ways to indicate the size of a window; for frame houses either the glass size or the sash size is given on the plan.

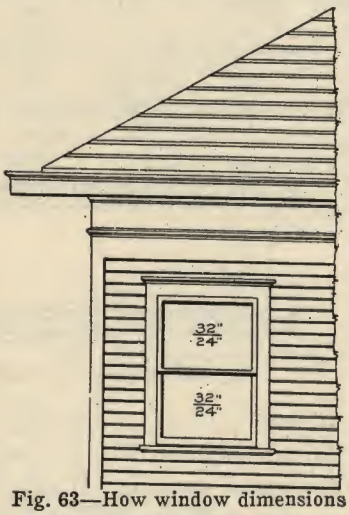


Fig. 63—How window dimensions are placed on elevation.

In Fig. 59 the left-hand window is marked for glass size, here the window is to contain 2 lights, each 30 inches wide by 24 inches long, the width being always stated first. The carpenter spacing the studs for this opening would allow about 10 inches more than this width for sash, frame and pockets; and in height he would allow 11 inches more than the 48 inches (the total of two 24-inch lights) for top-rail, meeting rail, bottom rail, top jamb, sill and sub-sill.

The right-hand window in Fig. 59 is marked with the sash size; here the carpenter would space his studding about 7 inches wider and 5 inches higher to allow for the frame and pockets, sill and sub-sill.

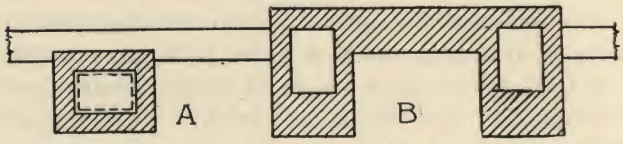


Fig. 68—Chimney and fireplace.

Showing Stone, Brick or Concrete Walls.

To show a stone, brick or concrete wall, the method shown in Fig. 60 is used; here three parallel lines are used; the wide space indicates the width of the stone, etc., and the narrow space the furring, lathing and plastering.

The dimensions on Fig. 60 show that the brick, stone or concrete opening is 2 feet 8 inches wide, and this opening starts 7 feet from the left-hand corner. The sash size is also stated as 2 feet 4 inches by 6 feet. To properly imbed the box frame a recess is necessary in the wall, and this will be about 4 inches wider than the outside opening in the wall. The height of window openings is given on the vertical sectional view, which is usually given with the front elevation; here is also stated the dimension from floor to sill—in fact, all necessary vertical dimensions or heights. A recess is also allowed in the height of a window opening in a masonry wall, and this is about 2 inches, made at the top only.

Fig. 69—Fireplace for grate.

Indicating a Double Hanging Window.

Fig. 61 shows the usual method of showing a double hanging window in a brick or other masonry

Fig. 64—Single swing single door.

Fig. 65—Single swing double door.

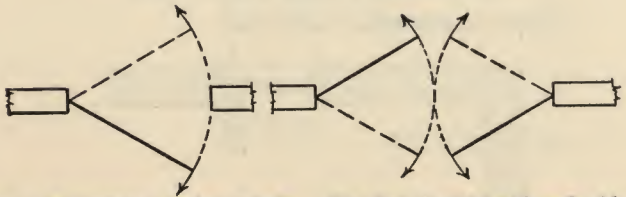


Fig. 66—Double swing single door.

Fig. 67—Double swing double door.

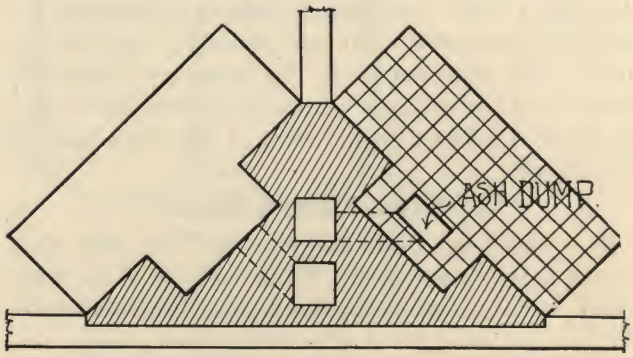


Fig. 70—Corner chimney with two open fireplaces.

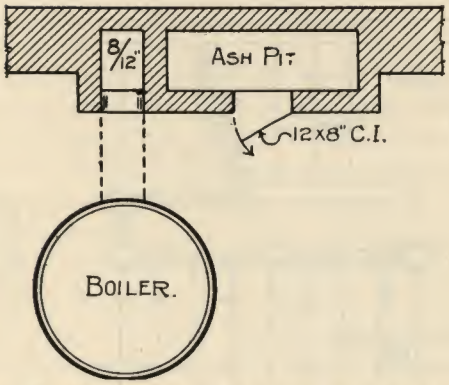


Fig. 71—How an ash pit is shown on cellar plan.

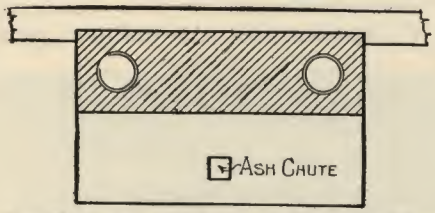


Fig. 72—Chimney with two round flues and hearth.

wall, but it is customary to place a frame a few inches back from the outer face of the wall; this will make it necessary to use a jamb lining, as shown in Fig. 62. This is a common omission on plans and specifications, but even tho it is not specifically shown and mentioned it is to go in at no extra expense, as it is needed to make a complete frame.

Window sizes are also placed on elevations; here the glass size is universally given, each light being marked with its size. Fig. 63 shows a two-light window, each glass measuring 32 inches in width and 24 inches in length—the width being always mentioned first.

Fire-Place Plans.

Figs. 64 to 67 give the methods of showing different kinds of doors.

Figs. 68 to 72 give the methods of showing the different forms of chimneys, fire-places, etc. A in Fig. 68 indicates a plain rectangular chimney, with flue lining built within the outside covering of the house. B shows a fire-place, the brickwork of which extends outside of the house and forming an outside chimney; there are two rectangular flues without flue lining.

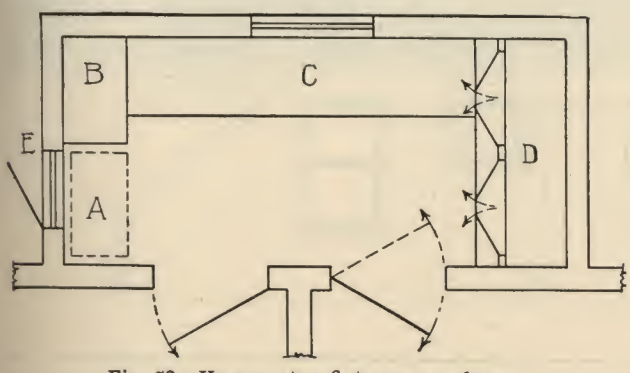


Fig. 73—How pantry fixtures are shown.

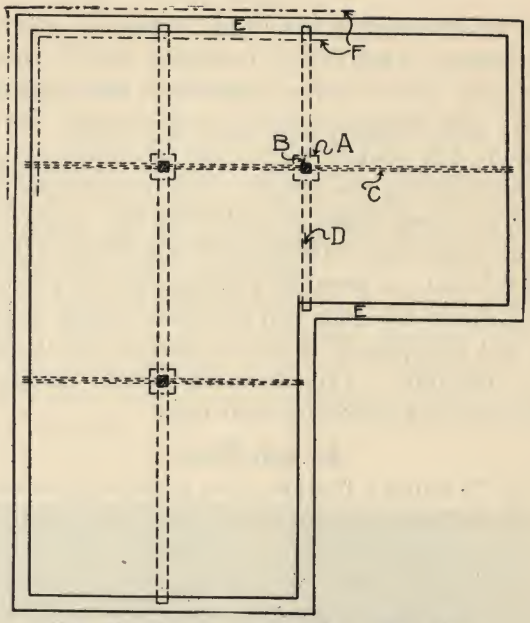


Fig. 74—Showing parts of a cellar plan.

Fig. 69 shows a fire-place designed for a grate fire; here also the chimney has two rectangular flues without flue lining.

Fig. 70 shows two corner open fire-places leading to one chimney, each having its own separate flue. The one on the left has a plain stone or cement hearth and the right-hand fire-place has a tiled or brick hearth.

Ash Pit Plans.

Also notice that an ash dump is indicated; this enables the ashes to be dropped into an ash-pit at the base of the chimney, and this is shown on the cellar plan like Fig. 71. Notice that the cleaning-out

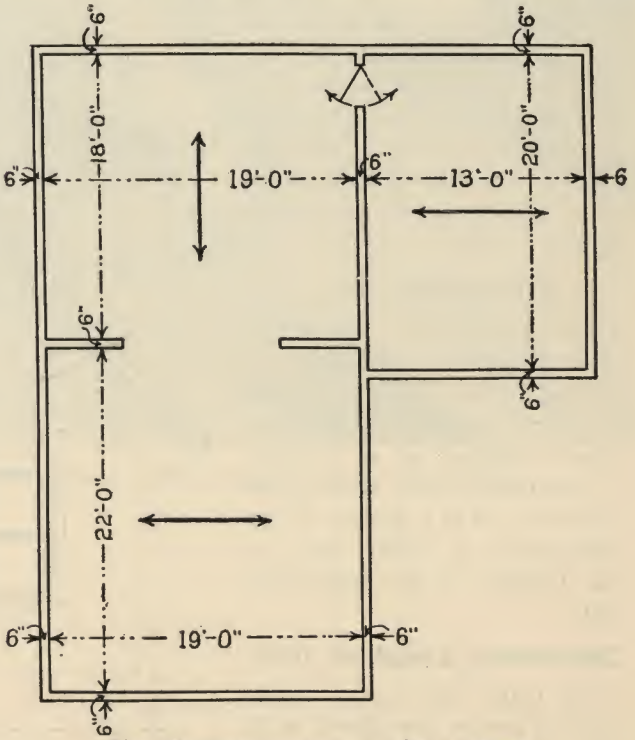


Fig. 75—How the run of joist is shown.

door is indicated in the same manner as any other door; thus, "8x12 C. I." means an 8x12" cast iron door, and this of course includes a cast iron frame for it. The height at which to place these clean-out doors is but seldom given, nor are any directions given regarding the ash-pit. The usual custom is to place the door about a foot from the cellar floor; it will cause more satisfaction if the distance is made about 3 feet, as then an ash-can may be placed directly under the door and the ashes simply shoveled out and dropped in the can without any lifting or back bending. The floor of ash-pit should be cemented and sloped toward door.

An Ash-Chute.

Fig. 72 shows a fire-place for a range, the chimney of which has two round flues with flue lining. Notice that this fire-place is provided with an ash-chute opening; the chute is usually of galvanized iron and leads directly over the position of the ash barrel, so that the ashes slide into the barrel. Notice

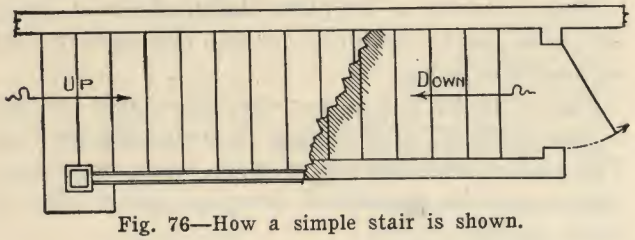


Fig. 76—How a simple stair is shown.

the difference between this "chute" and the "dump" shown on Fig. 70.

Pantry Arrangement.

Fig. 73 shows a pantry arrangement connecting a kitchen on the left to a dining room on the right. A indicates a zinc or galvanized iron drip pan from an ice-box, ice being placed in same from the outside thru the little door E; B is a series of shelves; C is a work table with drawers underneath, and D is the dresser or china closet.

A Foundation Plan.

Fig. 74 shows a foundation plan in which A indicates the footing for the column or post B; C is a double row of joists placed together, so as to carry a partition or two frame floor beams on; D is a girder; E the foundation or cellar wall; F the footing of the foundation wall.

Determining Length of Joist.

On many floor plans double pointed arrows are drawn as in Fig. 75; this indicates which

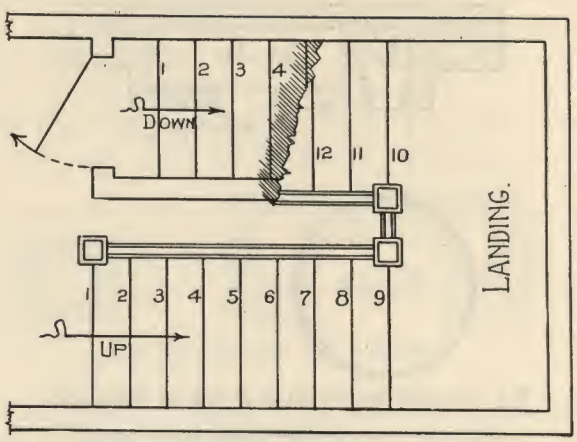


Fig. 77—Platform stair with each riser numbered.

way the floor joists are to run. In construction it is more economical to use as short joists as possible, and in Fig. 75 it will be noticed that the joists are placed over the shortest spans.

Common Stairs.

In previous illustrations stairs were represented, but it will be better to include here a larger illustrations. Fig. 76 shows ordinary common stairs with the wall on one side and a handrail on the other; the lower step extends out further than the other step, and on this is placed the newel. About halfway up a broken line discloses a section of the partition under the string and the stairs leading down to the celler; the arrows indicate which way the stairs run.

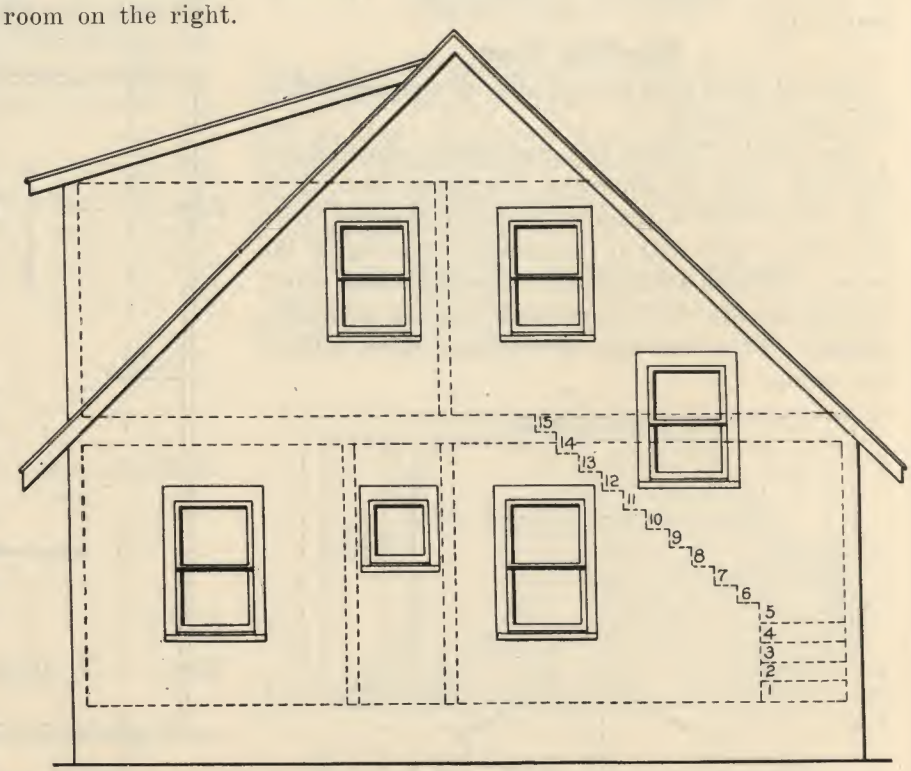


Fig. 78—Showing sections of rooms, floors and stairs with dotted lines.

Platform Stairs.

Fig. 77 shows a platform stairs, which will be readily understood. It will be observed that each tread is numbered at the outer edge; these numbers indicate the risers. Many mistakes occur in reading the plan of a stair by taking as many risers as there are treads shown in the plan. It must be remembered that there is always one more riser than tread. In Fig. 77 there are nine risers to the landing or platform, but only eight treads. Owing to the number of errors made on stairs, many architects have adopted the method of numbering the risers, but where it is not done the workman must be on his guard to be sure he is right before he starts cutting and erecting. Further on more will be said about avoiding stairway errors.

Stair and Floor and Ceiling Lines.

Frequently a plan or section of some part is shown by dotted lines; thus on an elevation the rooms are frequently shown as in Fig. 78 or the floor and ceiling lines only are shown.

The location of the stairway is also indicated by dotted lines, on the elevation showing that the proper space has been allowed for treads and risers and to show that the proper space for head room has been allowed.

Part of class in carpentry work at a manual training school building stairs for their new building.

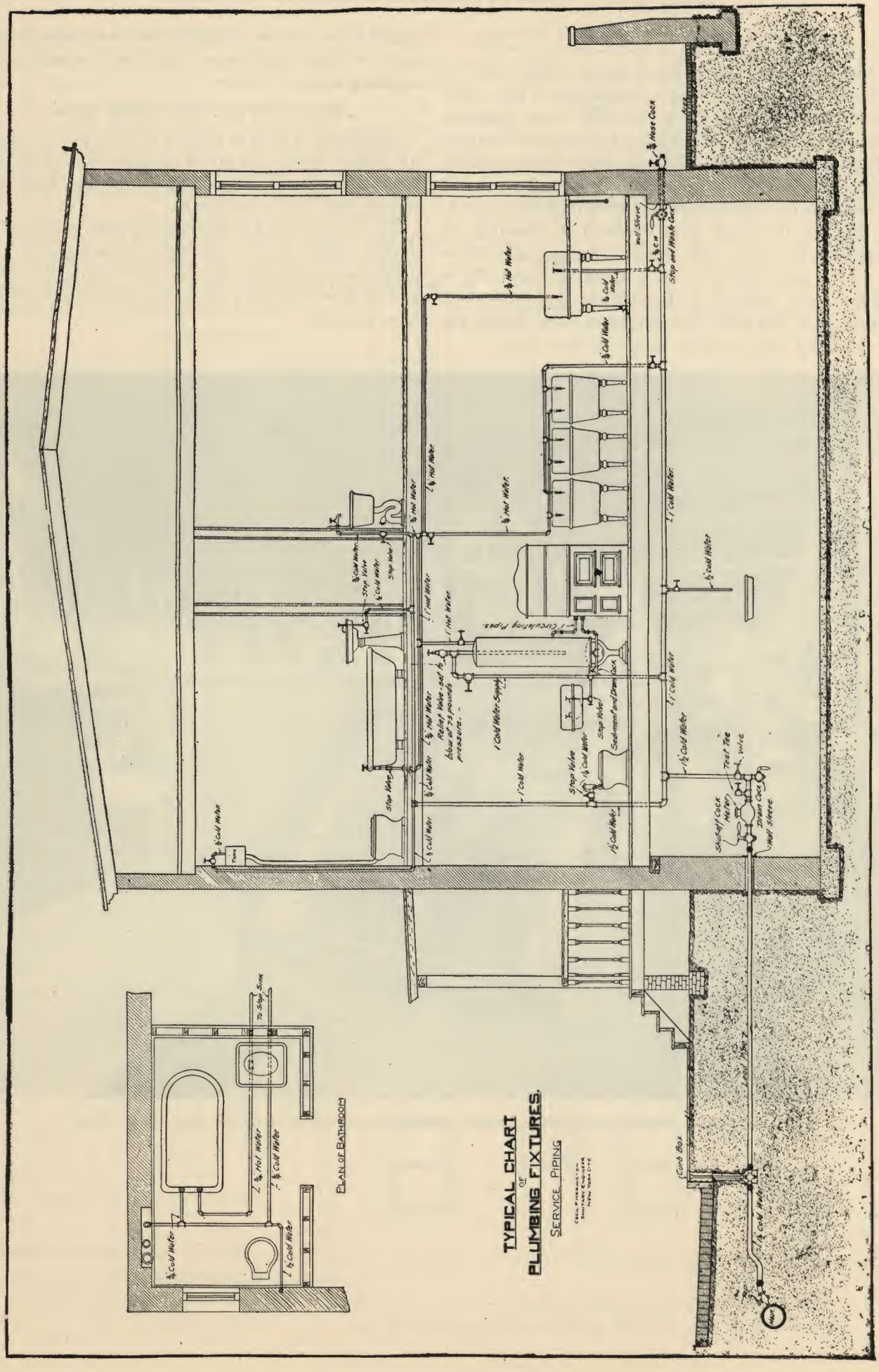


Fig. 79. Chart Showing Complete Service Piping for a Modern Two-Story and Basement Residence; as Prescribed by the 1912 New York City Plumbing Code.

CHAPTER IX.

PLUMBING AND HEATING

Besides the plan showing the location of the plumbing fixtures in bathroom, kitchen, etc., it is customary for the architect to show a "Plumbing Section;" this is a diagram of the drainage and venting, but this does not show the water supply.

In residence work this is not necessary, but in a large office building or hotel it is necessary to take into consideration where the water pipes are to go; in fact, in these large buildings it is customary to have what they call pipe wells or shafts where all the pipes and electrical feed wires are run, and at each floor an entrance to this shaft is provided so that future repairs can be easily made without ripping down wall after wall; in private residences or small flats this provision is not done except in rare instances.

A Typical Plumbing Section.

Fig. 80 shows a typical plumbing section for a small private house. Fig. 79 shows a sectional picture of all the drains and vents for a similar house with a few more fixtures, and Fig. 82 shows the water supply. A close study of these different diagrams will make clear the entire plumbing system of the ordinary house. A good plan is to trace out all the hot water lines in red to distinguish them from the cold water supply.

In laying out plumbing work particular care should be taken to get the pipes centered properly.

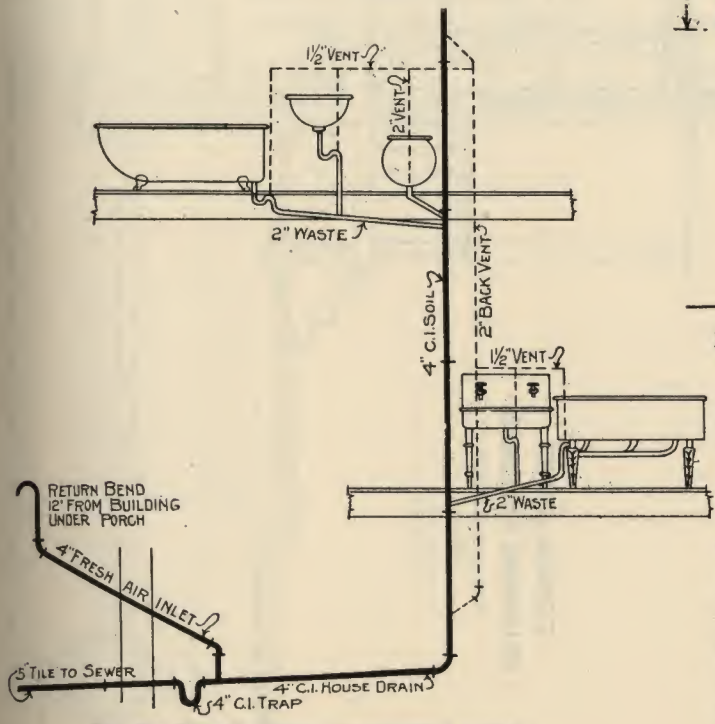


Fig. 80—Details shown on plumbing section

All plumbing supply houses give roughing measurements for their various fixtures so that the plumber will know where to place his pipes. Fig. 81 shows a typical drawing showing the roughing in measurements for a corner sink with drainboard and integral back.

Coils and Radiators.

Heating arrangements are also shown on the plans in a conventional way. The furnace or boiler is usually shown by a dotted circle in the position it is planned to occupy. Usually the pipes are represented by a single solid line; frequently, however, there may be two or more pipes, one under the other, and in the plan these must necessarily be shown

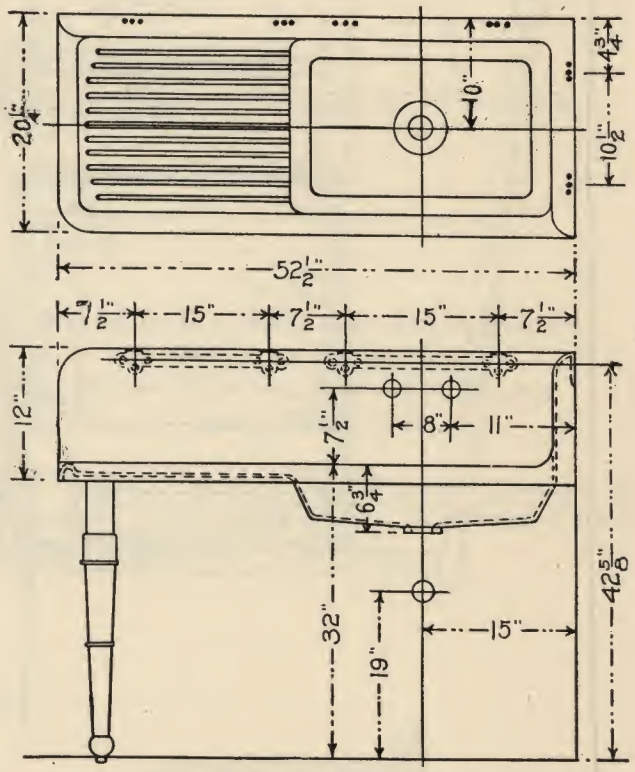


Fig. 81—Roughing in measurements for plumbing

side by side. To prevent misunderstanding the main is usually indicated by a solid line, the return by a dotted line, and the drip by a broken line as shown in Fig. 83. The fittings are usually shown by simply crossing the pipe lines with short lines and circles or parts of circles. All this will be self-explanatory by an examination of Fig. 84. Coils are shown as in Fig. 85, radiators as in Figs. 86 and 87. Fig. 88 shows a pin radiator. Fig. 86 is marked to show that the radiator is to have 50 square feet of

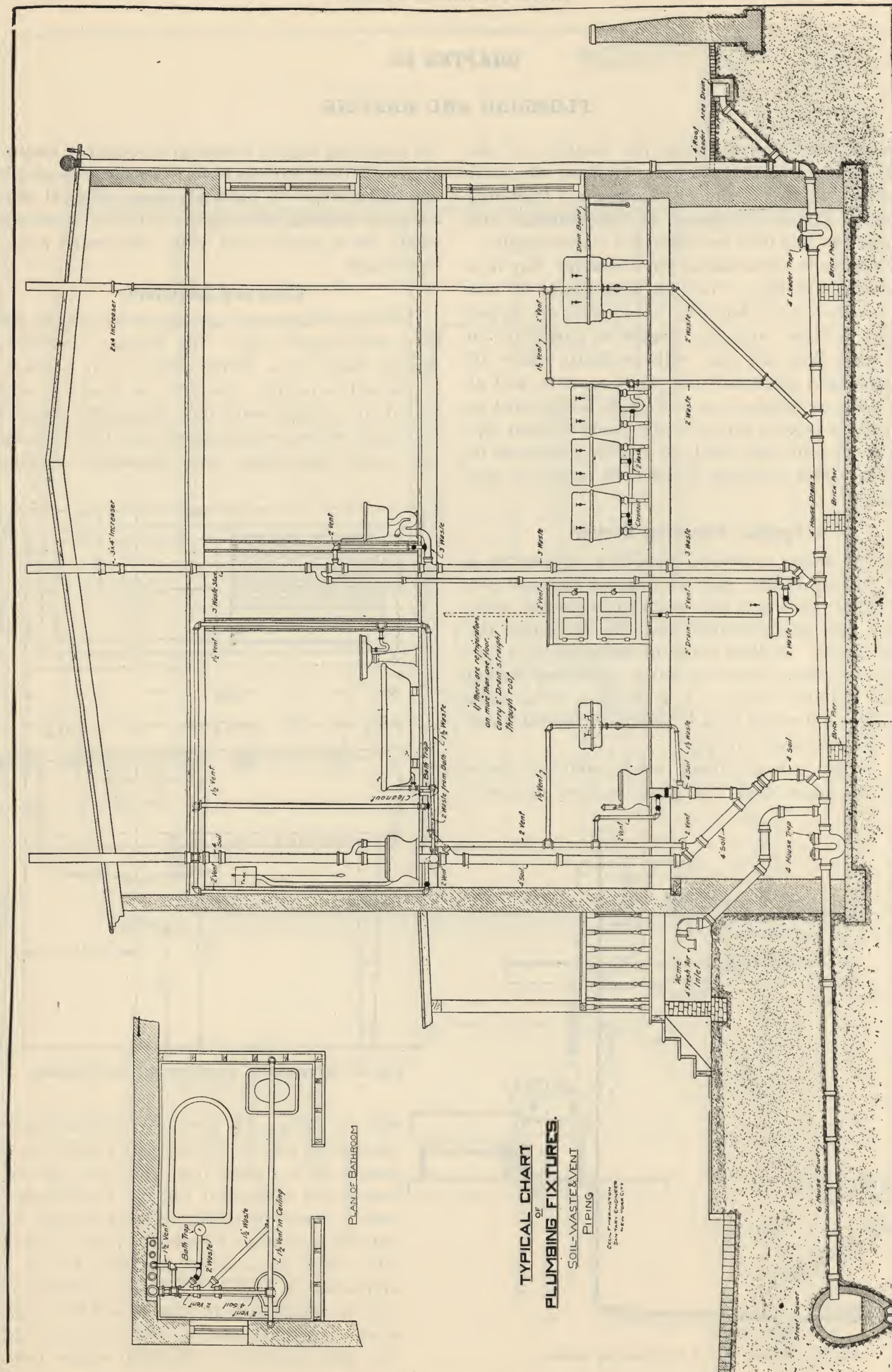


Fig. 82. Chart Showing Complete Drainage and Vent System for a Modern Two-Story and Basement Residence; as Prescribed by the 1912 New York City Plumbing Code.

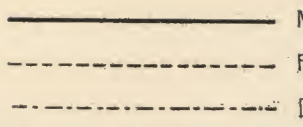


Fig. 83—How steam and hot water pipes are shown.

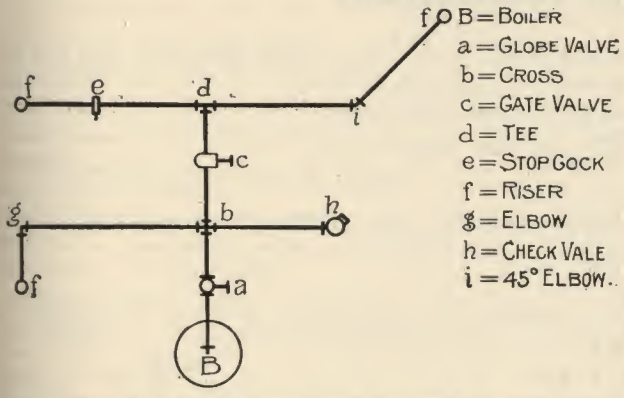


Fig. 84.—How a steam pipe system is shown.

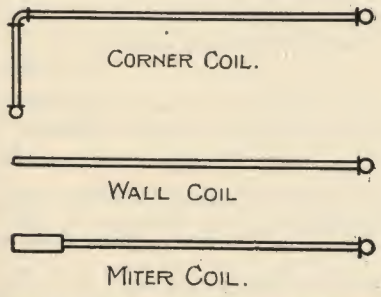
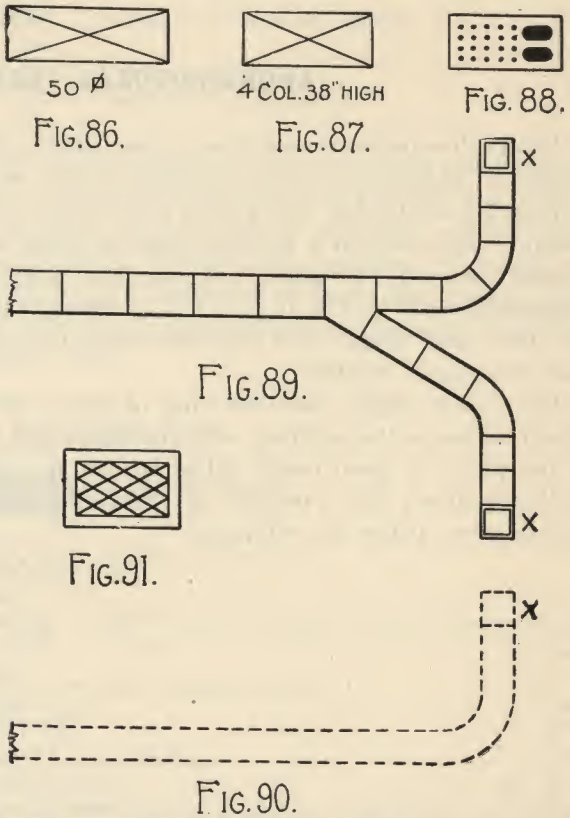


Fig. 85—How different coils are shown.

radiating surface, while Fig. 87 indicates that a certain height, 38 inches, and a 4 column radiator is desired. In Fig. 89 a hot air pipe is shown, or this may be dotted, as in Fig. 90. Where a register is to be placed a small heavy rectangle is made as at "x."

On a floor plan or section the registers are indicated by a small rectangle with a number of cross lines as shown in Fig. 91. The sizes of the registers



Figs. 86, 87, 88—Different ways of showing radiator.
Fig. 89—How hot air pipes are shown.
Fig. 90—Another way of showing hot air pipes.
Fig. 91—Radiator Face.

are frequently marked on the plan or the size is mentioned in the specifications. Wall registers are marked "Reg."

CHAPTER X.

ARCHITECTURAL TERMS AND ABBREVIATIONS

Besides dimensions the architect places on the plan various notes to convey to the mechanic exactly what is wanted and of what each part is to be made. For instance, on a plan of a kitchen closet it might say "⅞x10" shelves 12" apart," or the floor may be designated as "2½ T & G N C P," to mean that a 2½ inch wide tongue and grooved North Carolina Pine flooring is wanted.

Other notes might state the kind of trim. Even notes relating to the painting, etc., are sometimes put on the plan. A good many abbreviations are used by the architect and a number of these in common use are given below for reference.

"	Inches
'	Feet
1 ce	Once
2 ce	Twice
3 ce	Thrice
A. B.	As before
1 B.	1 brick
Bd. & Pt.	Bed and point
B. & J.	Bed and joint
B. S.	Both sides
B. & S. W. G.	Brown and Sharp wire gauge
B. W. G.	Birmingham wire gauge
C. I.	Cast iron
C. and P.	Cut and pin
Ch.	Chimney
Cir.	Circular
Cmt.	Cement
D. H.	Double hung
D. P. C.	Damp-proof course
Ddt.	Deduct
Dist.	Distemper
D. S.	Down spout
Dia.	Diameter
D. S. (on a window)	Double strength
Ex.	Excavate
E. O.	Extra only
F.	Flatting
F. C.	Fair cut
F. and C.	Fill and cart away
F. E.	Feather edge
F. & R.	Fill and ram
Foots.	Footings
Frd.	Framed
G.	Grain
G. L.	Ground or grade line
Galvd.	Galvanized
H. B. S.	Herring-bone strutting
H. P.	High pressure
K.	Knot
Lab	Labor
L. P.	Lath and plaster
L. P. & S.	Lath, plaster and set
L. P. F. & S.	Lath and plaster float and set
L. W.	Limewhite
M. G.	Make good
Mold.	Molded
No. or #	Number
N. C. P.	North Carolina pine
O. C.	On centers
O. G.	Ogee
O. S.	One side
P.	Prime
P. C.	Prime cost
P. F.	Plain face
P. F. & R.	Part fill and ram
P. M.	Purpose made
Pl. Cor.	Plaster cornice
Pt. Cmt.	Portland cement
R.	Render
Rad.	Radiator
R. S.	Render and set
R. F. & R.	Return fill and ram
R. F. & S.	Render float and set
R. C.	Rough cutting
R. I.	Rolled iron
R. W. P.	Rainwater pipe
R. O. & P.	Rake out and point
Reb.	Rebated
Reg.	Register
Rel. Arch	Relieving arch
Ro.	Rough
Ro. Sk.	Rough sunk
Sk.	Sunk
S. D.	Screw down
S. L.	Short length
Seg.	Segmental
S.	Skewback
Sq.	Square
Sq. Q.	Squint quoin
C. S. (on a window)	Single strength
St.	Stop
Sup.	Superficial
V.	Varnish
W. B.	Wood brick
W. I.	Wrought iron
W. P.	White pine
W. O. S.	Wrought one side
Wrot.	Wrought
X Ton	Cross tongue
Y. P.	Yellow pine

There are many other notes, details, and conventional methods, and a number of these are given on the complete set of plans; these will be presently explained. There are no hard or fast rules that are universal with architects as to how the different arrangements are shown on plans, but the methods mostly in use are given in this book.

CHAPTER XI.

WIRING AND METAL WORK

The gasfitter and electrician have to know where the different outlets and the kind of fixtures are to be placed and therefore a set of plans must show this information for them. A cross with a small circle over it is usually employed to show an outlet. The following are the standard symbols for wiring plans as adopted by the National Electrical Contractors Association of the United States, and are now being used on a number of plans:

Ceiling Outlet; Electric only. Numeral in center indicates number of Standard 16 C. P. Incandescent Lamps.

Ceiling Outlet; Combination. 4/2 indicates 4-16 C. P. Standard Incandescent Lamps and 2 Gas Burners.

Bracket Outlet; Electric only. Numeral in center indicates number of Standard 16 C. P. Incandescent Lamps.

Bracket Outlet; Combination. 4/2 indicates 4-16 C. P. Standard Incandescent Lamps and 2 Gas Burners.

Wall or Base-board Receptacle Outlet. Numeral in center indicates number of Standard 16 C. P. Incandescent Lamps.

Floor Outlet. Numeral in center indicates number of Standard 16 C. P. Incandescent Lamps.

Outlet for Outdoor Standard or Pedestal; Electric only. Numeral indicates number of Standard 16 C. P. Incandescent Lamps.

Outlet for Outdoor Standard or Pedestal; Combination. 6/6 indicates 6-16 C. P. Standard Incandescent Lamps; 6 Gas Burners.

Drop Cord Outlet.


One Light Outlet, for Lamp Receptacle.


Arc Lamp Outlet.


Special Outlet, for Lighting, Heating and Power Current, as described in Specifications.


Ceiling Fan Outlet.

Single Pole Switch Outlet.

Double Pole Switch Outlet.

3-Way Switch Outlet.

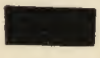
4-Way Switch Outlet.

Automatic Door Switch Outlet.

Electrolier Switch Outlet.

As many symbols are shown as there are switches; in case of a very large group of switches the number of switches is indicated by a Roman number; thus S XII means 12 single pole switches. For the particular type of switches as flush, snap surface, etc., one must see the specification as it ought to be mentioned there.


Meter Outlet.

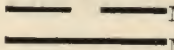

Distribution Panel.

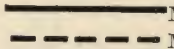

Junction or Pull Box.

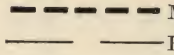
Motor Outlet; Numeral in center indicates Horse-Power.

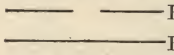

Motor Control Outlet.

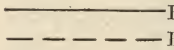

Transformer.

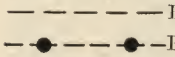

Main or Feeder Run concealed under Floor.

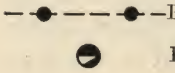

Main or Feeder Run under Floor above.


Main or Feeder Run exposed.


Branch Circuit Run concealed under Floor.


Branch Circuit Run under Floor above.


Branch Circuit Run exposed.


Pole Line.


Riser.


Telephone Outlet; Private Service.


Telephone Outlet; Public Service.


Bell Outlet.


Buzzer Outlet.

Push-Button Outlet; Numeral indicates number of Pushes.

Annunciator; Numeral indicates number of Points.


Speaking-Tube.

Watchman Clock Outlet.

Watchman Station Outlet.

Master Time Clock Outlet.


Secondary Time Clock Outlet.


Door Opener.


Special Outlet; for Signal Systems, as described in Specifications.


Battery Outlet.

The wiring is not usually shown on a plan except in the case of switches or some special grouping of lights as shown in Fig. 92.

Skylights are usually shown by dotted lines on the floor plans of the floor that they are to be over, as shown on the plan in Fig. 93; the top of the sky-

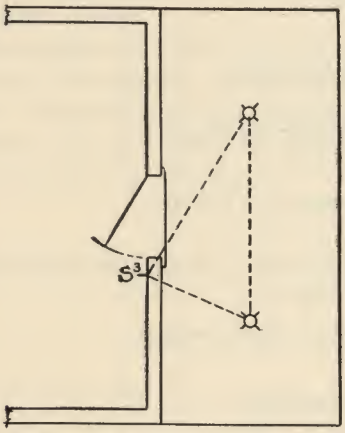


Fig. 92—How a three pole switch controlling two porch lights is shown.

light would be shown on the plan of the next floor as in Fig. 94.

It will be noticed that the ribs of the skylight are shown somewhat similar to a framing plan of a hip roof which of course it really is. Fig. 94 also shows that a galvanized iron gutter is located at the rear

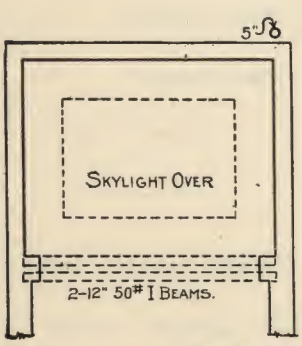


Fig. 93—Skylight on first floor.

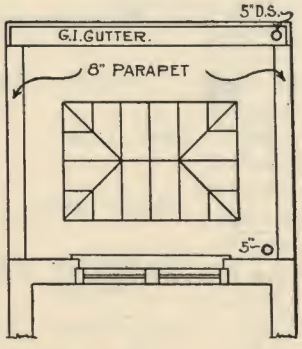


Fig. 94—Skylight on second floor.

How a skylight is shown.

of this extension from the front portion of the building. The gutter for the main building is also situated at the rear discharging on the roof of the extension thru a 5″ leader which is shown by a small circle marked 5″. In the gutter at the rear there is also a 5-inch down spout marked simply "5″ D.

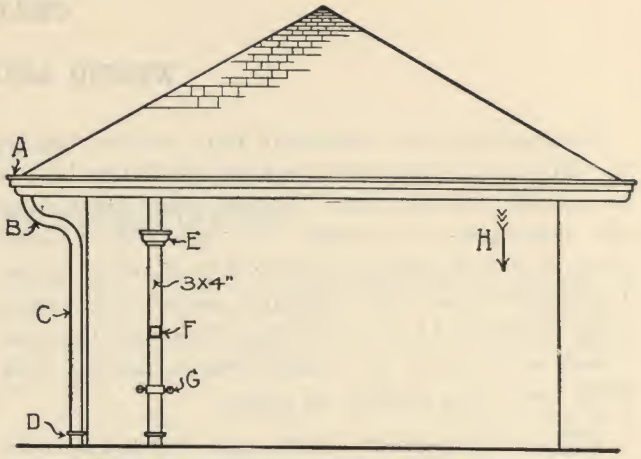
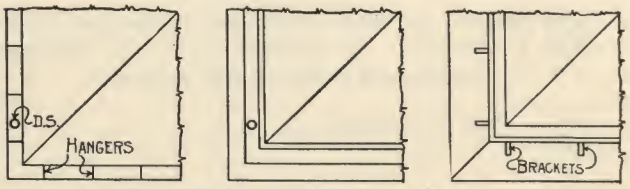


Fig. 95—How leaders are shown on elevation.

S.," and the leader from this is also shown on the plan of the lower floor, Fig. 93.

Leaders are sometimes drawn on the elevations as shown in Fig. 95, in which A shows the gutter, B the elbow connecting the down spout with the leader and C the leader, D is a cast iron base for the leader connecting to the sewer pipe, dry well, etc. So far the leader has been shown on the side of the house, but it is also shown on the face of the house which the elevation represents. At E an ornamental hub is designated. Sometimes the size of the leader is marked on the elevation. In Fig. 95 it is marked 3x4″, meaning that it is rectangular in shape. If it was to be a round leader it would be marked 5″ Diam., or simply 5″. Sometimes a small section of the leader is given to show its shape as



Figs. 96, 97, 98—Metal work detail.

shown at F. G shows that the leader is held to the wall by ornamental straps.

For the material of the leader we will have to look in the specifications, altho sometimes it is marked directly on the plans or elevations. Frequently the locations of the leaders are simply marked by an arrow, as at H. In most cases the leaders are not shown on the elevations, but the down spouts are shown on the plan of the roof and of course this means that a leader is located at that point.

There are three principal kinds of gutters—hanging, box, and standing; and these are shown on the roof plans as shown in Figs. 96, 97, and 98. Hanging gutters are held in place by hangers and these are shown in Fig. 96. A standing gutter is held up by brackets and these are indicated as shown in Fig. 98.

CHAPTER XII.

READING A COMPLETE SET OF PLANS

The ABC's of plan reading have been explained, and the reader will have a definite idea of just what the different lines on a set of plans mean.

As a practical test a complete set of architect's working plans is given in Figs. 99 to 109.

Usually working plans are drawn to a scale of ¼ inch to the foot, but owing to the small size of the page in this book it has been necessary to present these plans drawn to a scale of ⅛ inch to the foot.

Fig 100 shows a section view of the side of the house, and from this view the various heights are taken, also the sizes of the framing timbers.

Reading a Sectional View.

From the section it is seen that the cellar wall is placed on a footing 2 feet wide and 10 inches thick, and that the cellar floor is of concrete 3 inches thick; this cellar floor is 4 feet 4 inches below the grade line.

The cellar wall to grade is of solid concrete 10 inches thick, above grade the walls are of concrete blocks 8 inches thick; this is marked 2 feet 8 inches, that is, it will be 4 blocks high: in actual construction, however, it is going to be a little higher than this, as the thickness of the mortar joint has not been considered. This will add about 1 inch to the height of the cellar which is here given as 7 feet. A little distance like this does not matter in the height.

Determining Length of Joist and Studding.

The dimension of the first floor height is given as 9 feet between the top of floor and the bottom of ceiling, therefore the carpenter would make the heights between joists 9 feet 2 inches to allow for flooring and lathing and plastering; this would perhaps be either a little more or less than the 2 inches allowed, but the height would most likely not be the specified 9 feet exactly; but, as said before, minute accuracy in height is not essential, as such a small difference would not interfere with the stairs (which are set off by a story rod anyway) or any other arrangements.

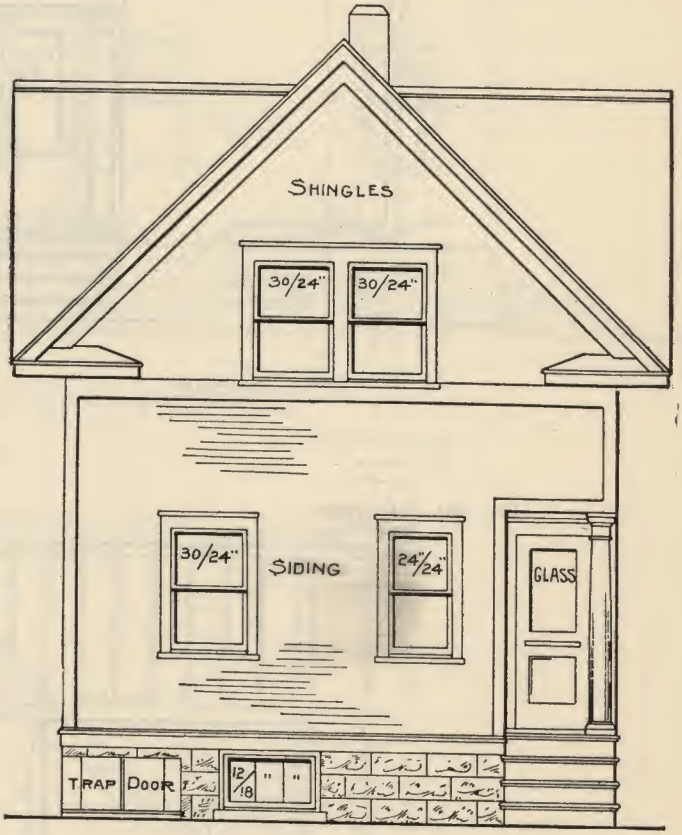
The first floor joists are 2 by 8 inches placed 16 inches on centers and the studs are 2 by 4 placed 16 inches on centers. The second story joists are also 2 by 8 inches placed 16 inches on centers. The rafters are 2 by 4 inches placed 16 inches on centers. The collar beams forming the ceiling for the second floor are 2 by 6 inches placed 16 inches on centers. The ribbon supporting second floor joists is 1 by 6 inches, and the plate is composed of two 2 by 4 inch pieces.

For information on the kind of timber to be used the specifications must be consulted.

The overhang of the roof is 2 feet, and the roof has a standing gutter, but this is only shown on this section and mentioned in the specifications. The tops of the windows are placed 7 feet from the floor.

Elevation Data Important.

Fig. 101 shows the front elevation. The first story is covered with siding up to the second story window level, this is marked on all the elevations, and is indicated in Fig. 101 by a number of short horizontal lines. On the Left Side Elevation only a few dashes represent the siding, while on the Rear and Right Side Elevations the siding is not indicated by any lines, being simply marked "siding."



REAR ELEVATION
Fig. 99.

To draw a representation of the clapboards and shingles would take up considerable time, and for this reason it is not done, but the method of just marking what it is, is followed.

The same remarks also apply to the gables, here only a few shingles are sketched in and marked "shingles," and this means that all of the upper part is to be covered with shingles.

The same method is followed with the lattice work under the porch, and in other parts where small de-

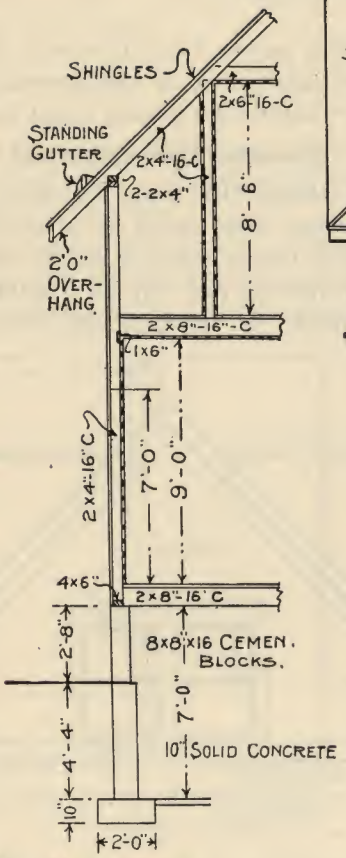
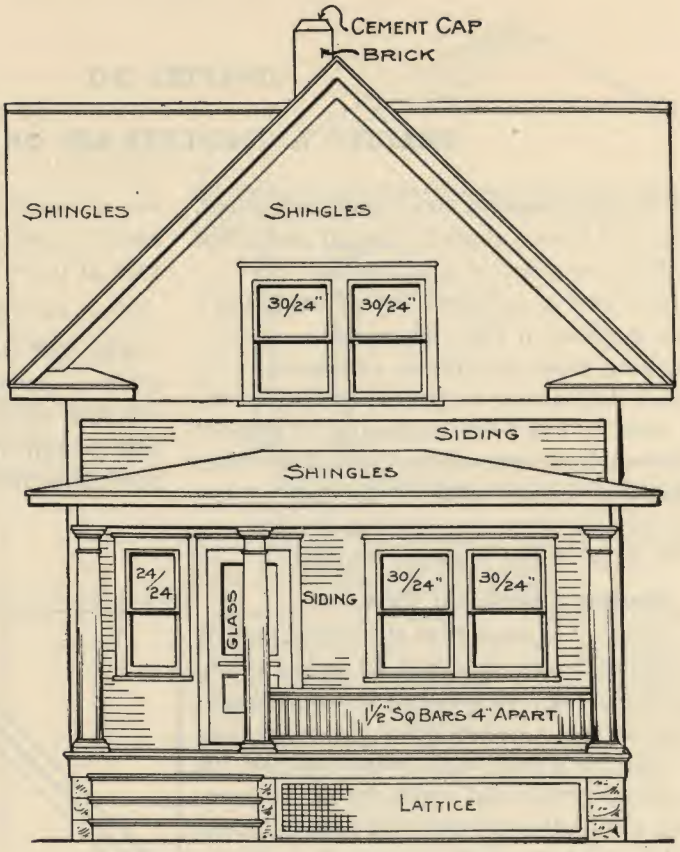


Fig. 100. SECTION



FRONT ELEVATION.

Fig. 101.

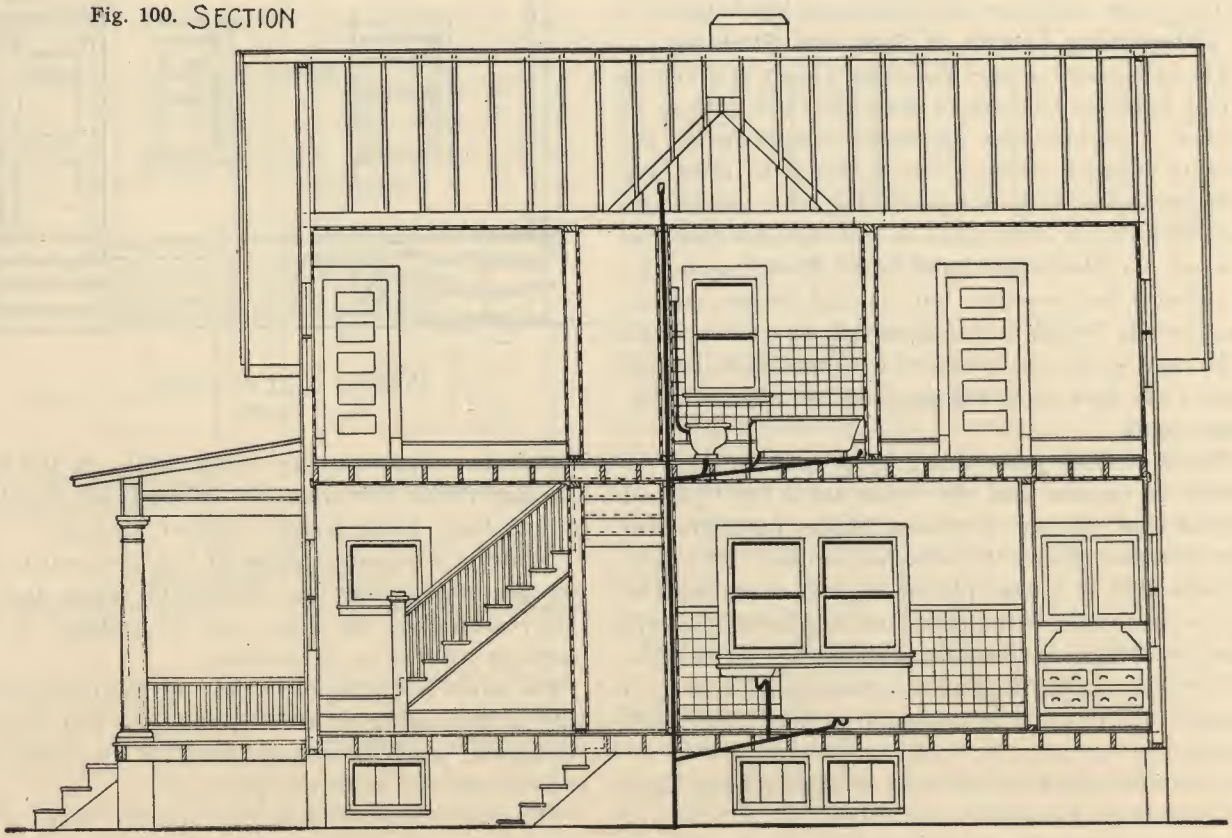


Fig. 102. SECTION.

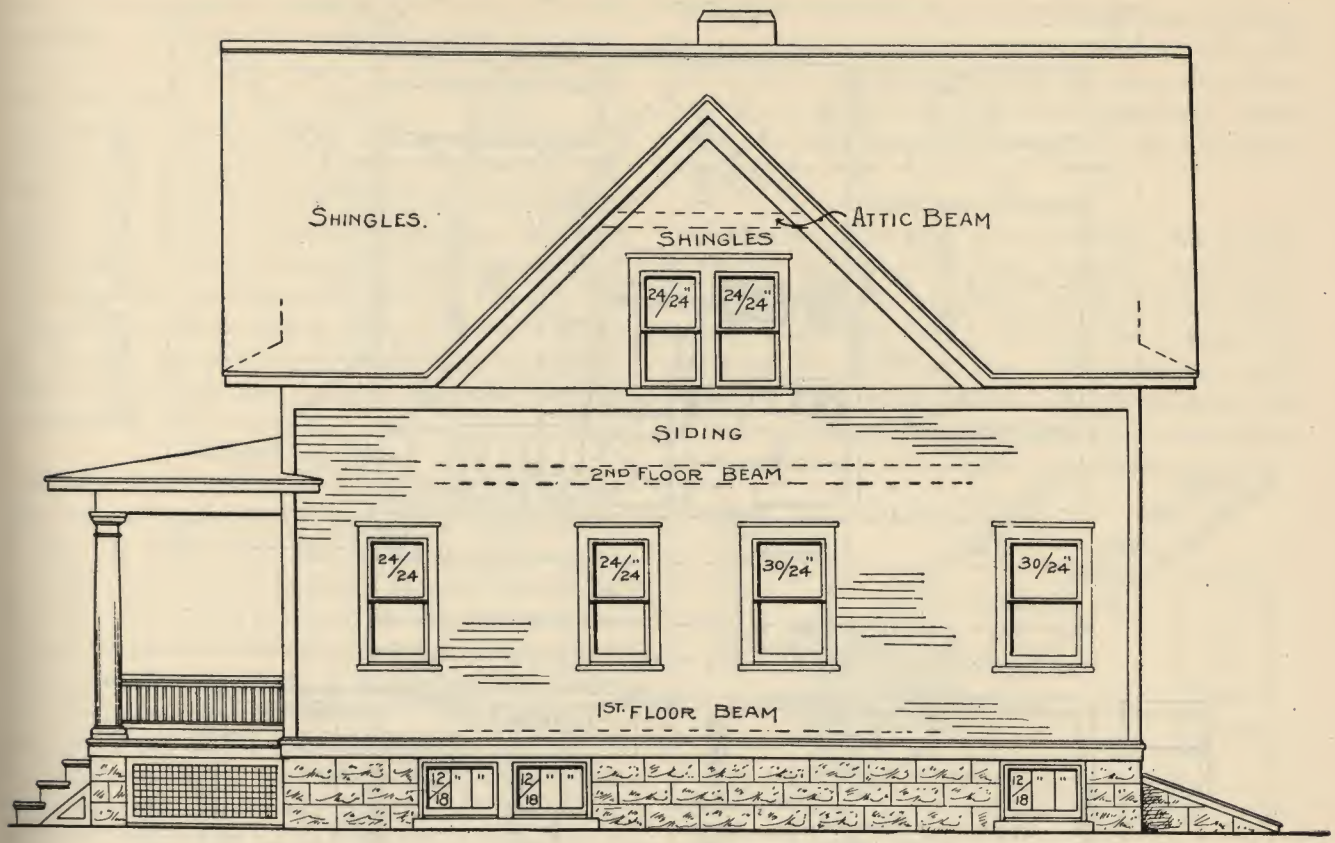


Fig. 103. RIGHT SIDE ELEVATION.

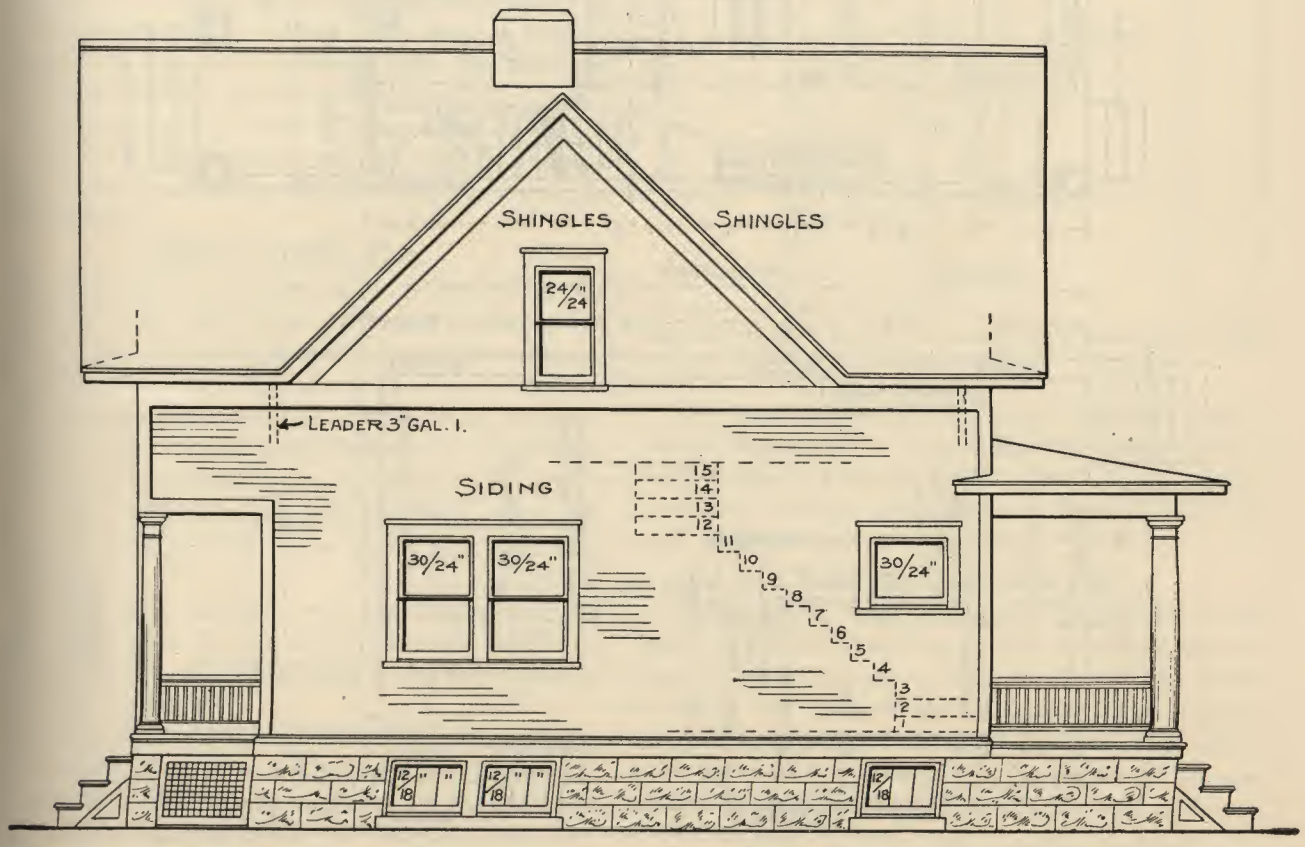
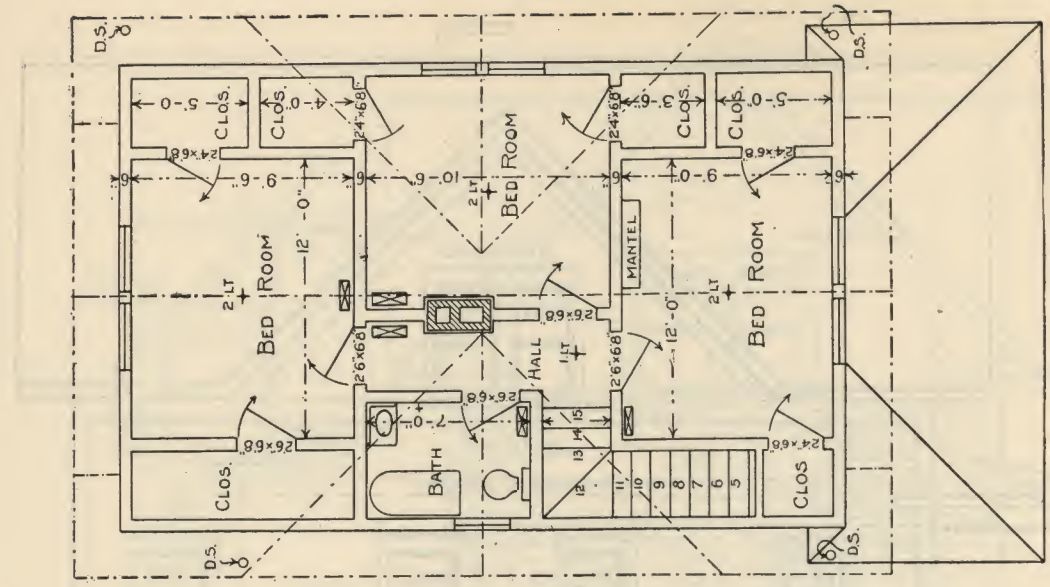
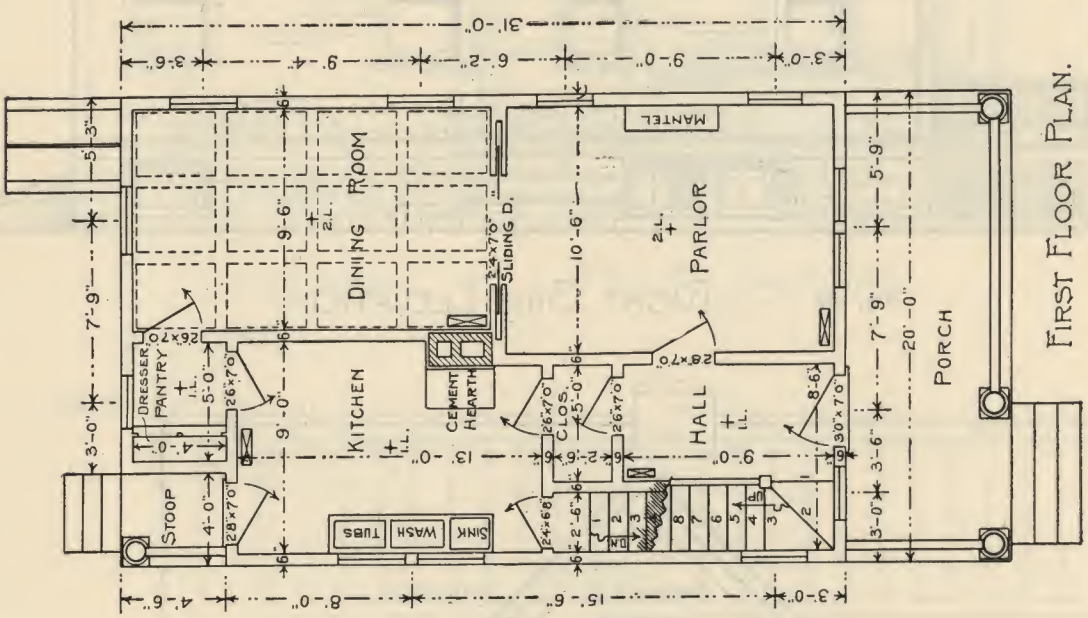


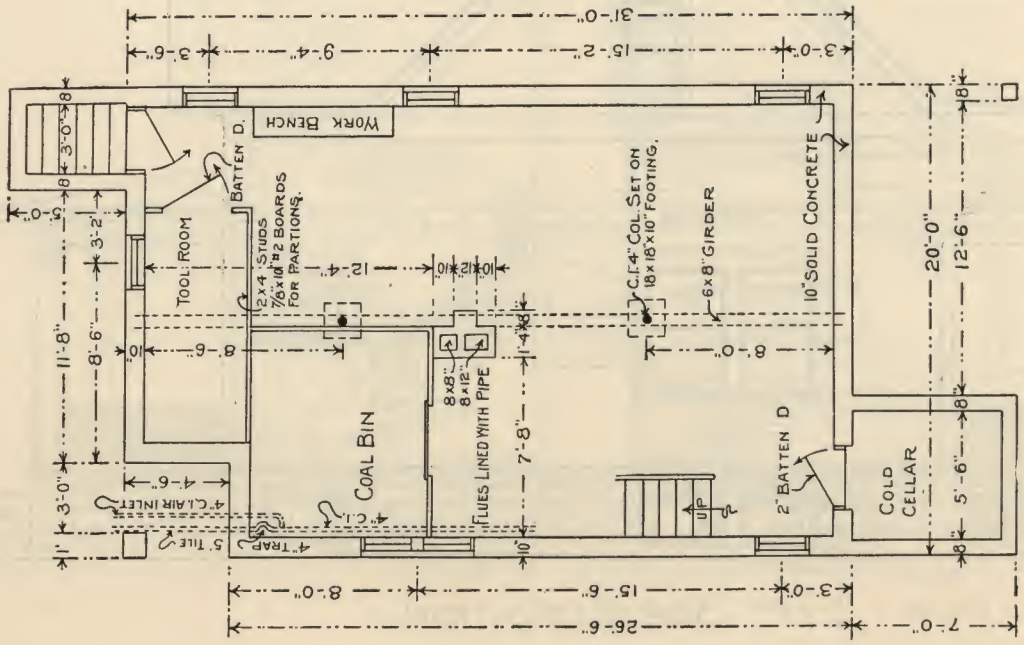
Fig. 104. LEFT SIDE ELEVATION.



SECOND FLOOR PLAN.
Fig. 107.



FIRST FLOOR PLAN.
Fig. 106.



BASEMENT PLAN.
Fig. 105.

tails are duplicated a number of times. This is frequently the case with porch and stair balusters, only one or two being drawn in place, the balance being understood to be required.

On the side elevations, Figs. 103 and 104, the sides of the gables are partly dotted in to show how the gable cornice is finished by slanting out the shingling instead of leaving a shelf-like projection over the cornice of the overhanging roof. The front and rear elevations show this same part and they will give the workman the correct idea of what is wanted. Right here it might be well to say again that one should look at all the different views of the same part before deciding what is meant.

Floor Plan Data.

On Fig. 103 the levels of the floor beams are shown; these lines will be handy to measure from. On Fig. 104 these same floor levels are shown, also the outline of the stairs is dotted in, each riser being numbered: when this is shown on the elevation the workman is sure of his stair problem. As mentioned before many errors occur in laying out the stairs from the plans only, but where the stairs are indicated as shown in Fig. 104, no mistake can occur, as it shows so plainly that fifteen risers are needed.

Fig. 104 also shows the location of the down spouts or leaders; this is also indicated on the second-floor plan, Fig. 107.

At the rear of Fig. 103 are two parallel lines slanting from the foundation wall to the ground line; this is the trap or cellar door for the outside or grade entrance to the cellar. This door is further indicated on the rear elevation and the entrance with steps is shown on the cellar plan.

The various other parts of these four elevations have all been explained in previous pages, and the reader should not have any difficulty in correctly reading them.

Details of Cellar Plan.

Fig. 105 shows the cellar plan, which gives the size of the cellar walls, but nothing is shown of the footing; this must be obtained from the section, Fig. 100.

The distances to the center of the cellar windows are given, also the total dimensions; if these were not given, they would have to be found by means of a scale. It is a good plan to check over each dimension with a scale, so as to be sure that they are right.

It will be well to check over the dimensions of a cellar plan to see if they agree with the totals; on this plan they do, but it will be well for the reader to go over this himself.

The dotted lines in the middle of the plan indicate a 6 by 8 inch girder set on a 8 by 12 inch brick pier built with the chimney; the distance of the chimney from the left side and from the rear are given, so that the mason will have no doubt as to exactly where the chimney is to be placed. On quite a number of plans, however, these dimensions are not given, and in such a case both the cellar and first-floor plans should be measured, allowance being made, of course, for the difference in the thickness of walls.

Piers and Columns.

Besides the brick pier at the chimney, the girder is further supported by two cast-iron columns, 4 inches in diameter, which are set on concrete footings 18 inches square and 10 inches deep; these are shown by the dotted squares. The distance to the center of these columns from the front and rear walls are given, and the distance from the side walls

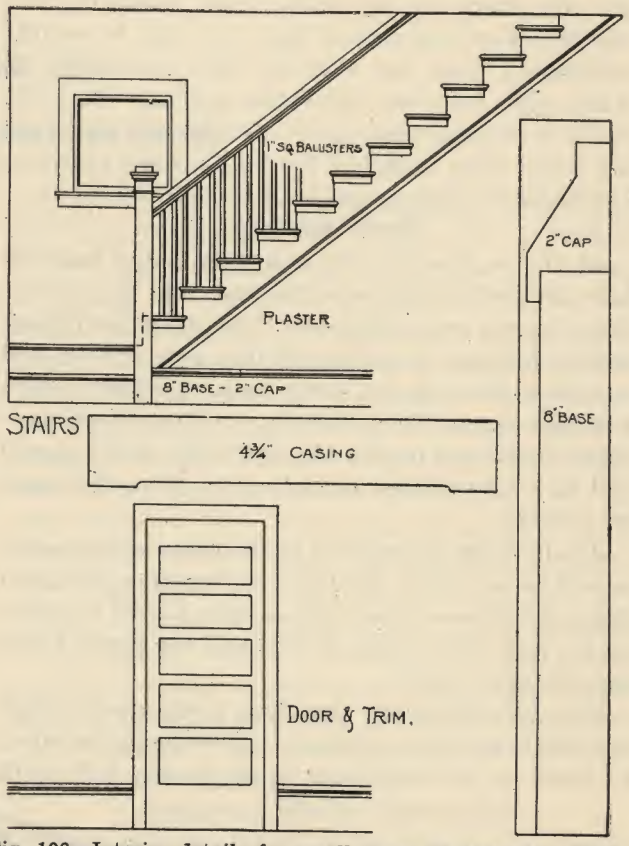


Fig. 108—Interior details for small house illustrated in Figs. 99 to 110.

is the same as that of the pier. But this has no center dimension; it is, however, 8 inches wide, so half of this, or 4 inches + 16 inches + 7 feet 8 inches = 9 feet 4 inches is the distance from the left-side wall to the center of the column.

Work Room and Coal Bin.

As this house was designed for a mechanic, a tool room and work bench have been arranged for; no size of this tool room or coal bin have been given, as these are unimportant matters. The arrangement of the plan is sufficiently clear to show that a small room and bin roughly partitioned off are desired to be constructed of 2 by 4 inch studs and covered with second-grade boards ⅞ by 10 inches.

The width of the steps of the grade entrance is

given, but the cellar-stairs width is not given; an inspection of the first-floor plan shows that it is given there.

Be Sure of Your Dimensions.

This point will make it clear to the reader that if a certain dimension is not given on a certain plan or elevation, it is most likely given on some other plan or elevation. For the prevention of mistakes caused by a confusion of figures, architects usually do not repeat a dimension, unless it is necessary; they are usually placed on the plan or elevation where they will convey the most information to the workman.

At the left side, from the middle of the cellar to the rear, there are two dotted lines, branching into two series of two dotted lines. As can be readily understood from the marking, this represents the waste pipe from the plumbing system. The little circle at the beginning is the cast-iron soil pipe coming down from upstairs; the dotted lines show the horizontal or sloping run in the cellar.

Fresh Air Inlet.

At the rear wall there is a trap and a fresh-air inlet for the ventilation of the trap and the prevention of sewer gas leaking back into the house piping. Inside the house a 4-inch cast-iron pipe is used, and outside to the cesspool, septic tank, or sewer a 5-inch tile pipe is used for the drain, while a 4-inch cast-iron pipe is used for the fresh-air inlet, which should end in a return bend placed as far from the house as possible.

A cold cellar is provided at the front of the house, as will be seen from the left side elevation, Fig. 104; this is built above grade of concrete blocks the same as the rest of the wall; the floor of the porch forms the ceiling or roof.

Fig. 106 shows the first-floor plan, about which very little need be explained. Care should be taken to check up all dimensions to see if they tally with the totals. It will be noticed that the total width is 20 feet, and the total length of the right side is 31 feet; these agree with the foundation.

It will be noticed in the kitchen that the line of the partition wall continues around the chimney; this indicates that the brickwork of the chimney projecting into the kitchen is plastered over.

Indicating Electric Lights.

In the middle of the parlor there is a + sign with 2L over it; this means that there is a chandelier with two lights: in the hall and kitchen only one-light chandeliers are indicated. As previously explained sometimes small circles are placed on plans to indicate chandeliers, on other plans a circle with a + mark on it is used, as will be noticed in the rear bedroom on the second floor.

The locations of the radiators, wash-tubs, sink, closet, etc., are all shown.

In the partition at the door leading to the cellar stairs there is a small circle, which indicates the location of the soil pipe from upstairs.

Here the dotted lines in the dining-room represent a beamed ceiling.

On plans for a small house, like this one, the dimensions to windows, etc., are frequently left off; in cases of this kind the workman must use his own judgment about centering the windows and doors.

Fig. 107 shows the second-floor plan; this does not present anything new that will not be readily understood if the previous pages have been studied.

Locating the Windows.

No dimensions are given on this plan where to place the windows, as they are shown centered directly under the ridge lines of the roof and therefore there will be no doubt as to where the windows are to go.

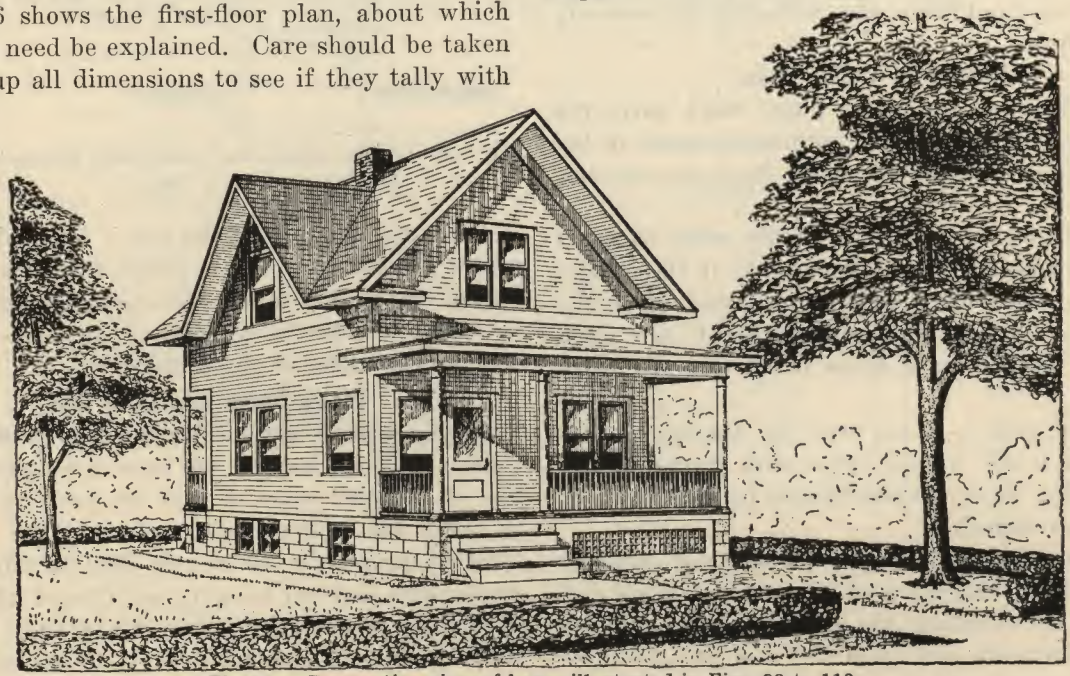


Fig. 110—Perspective view of house illustrated in Figs. 99 to 110.

The roof lines are all shown on this plan in dotted lines, as this not only saves a separate plan, but shows the relation of the windows, partitions, etc., to the ridges and valleys. This is much better than if separate plans were given for second floor and roof.

Fig. 108 shows all of the interior details that are necessary for a small house. The style of doors and trim with a view of the stair arrangement is sufficient for any mechanic to interpret correctly the architect's meaning.

Fig. 102 shows a section of the building; this shows the arrangement of the drainage pipes from bathroom and kitchen. Notice the vent leading to the roof which ventilates the plumbing system, and prevents sewer gas collecting.

Sectional plans like this are very seldom given for small houses, but it has been introduced here, so that the reader will have something like a picture of the interior of the house to compare with his own idea of how the house will look from his study of the plans and elevations.

For the same reason a perspective view of the house is given in Fig. 110. From a careful study of the plans and elevations the reader should have pictured in his mind a view of a similar house.

CHAPTER XIII.

MISTAKES IN READING PLANS

Study a set of plans so that you will be in sympathy with the architect's idea. Remember that before the architect could complete his plans he had in his imagination a picture of the entire house. When you have in your mind a mental picture of the house, the same as the architect had, the hardest part of plan reading is over and it will be an easy matter to work from the plans.

Of course no two buildings are exactly alike but you can follow a system of reading a plan and taking off quantities that will enable you to do each job systematically.

Be careful all the way thru. Do not take anything for granted. Find out what everything means before starting to do it. Don't fall into the habit of "Oh, what's the use." Examine and compare the floor plans with the elevations. Don't jump at conclusions after seeing only one plan or elevation; look at them all and compare them. If there is some discrepancy, real or apparent, consult the architect; it may be possible that it is a mistake on his part.

Be Careful.

Don't make any changes or alterations, unless you are positive that it will not affect some other part in a serious manner. It may be more convenient to move the location of a chimney on the first floor, only to find out that it comes into the middle of the room upstairs; or you move a partition, only to find it goes to the middle of a window. Be sure you are right before you go ahead.

Be particular to check all figures and where a difference is found take your scale and measure the drawing. Where you think there is an error call the architect's attention to it. Do not pass it over and carry out the work, errors and all.

Drawing to Scale.

If you receive a drawing with no scale marked on it, it is probably drawn to ¼" scale, but to make sure of this lay a scale on and measure several parts that are dimensioned—it is important to measure several parts—sometimes a dimension is changed purposely to a different size than drawn out, and again the draftsman or architect may have made an error. Go over several dimensions first and if all are alike, or the majority agree, you know that you have the right scale. In measuring a blue printed set of plans it may be that they are not to scale. Paper blue prints are prepared by soaking in water and they shrink a little when they dry again; for this reason their scale varies a little from the original drawing but really not enough to be noticed in most cases. With cloth prints, however, the shrinkage is considerable and they sometimes dry out crooked so that it is impossible to scale from them—do not attempt to follow any but a written dimension from a cloth print. Sometimes there is an inch shrinkage in a three foot print.

Supplying Missing Dimensions.

Many mistakes occur in reading the dimensions, so take particular pains about this. Sometimes a draftsman will omit a dimension and later someone will mark it in and perhaps get it upside down, which in the case of the 6 and 9 will be bound to lead to quite an error unless the workman is wide awake. If you see a dimension marked 9, and it is smaller than one reading 8, you must be on the alert, to catch the error, etc.

On any plan which you are to work from, always compare the different floor plans with one another, and if lines occur on one that are not clear to you, look carefully at the plan of the floor below or floor above, as something on these other floors is, no doubt, the cause for the change.

Comparison between all the different views, with an examination of the detail drawings and taking the dimensions from them is not as hard as many

seem to think, and anyone who shall read this book carefully and study the illustrations will have no difficulty in reading a plan.

Foundation Projections.

In laying out the foundation plans do not overlook the projection for baywindows, cellar entrances and outside chimneys and get them in the positions called for on the plan. If a dimension is given, follow that dimension in preference to the scale. We have known cases where the foundation was made and the chimney foundation with ash pit, etc., entirely omitted, due to neglect to look at the plans after the principal dimensions were staked out.

On Making Changes.

Be careful of changes that are made while the building is in course of construction, as there is a chance to get something off line somewhere—it may be in the same room or it may be upstairs or downstairs, do not change until you know what you are doing. An illustration will make this clear. In Fig. 111 everything—beam ceilings, windows and doorway—are shown centered, and all are evenly balanced. Now when the building was under construction, the owner, who was doing his own supervising, decided to have a double sliding door. The extra 3″ necessary for this was enough to throw out of center the entire front wall and beam ceiling effect. Wall spaces A and B were uneven, Fig. 112, and the window out of center, all due to the overlooking of a matter of 3″ in spacing. In a case of this sort it would have been a good investment if the owner had paid to have the mullion window moved 1½″, not 3″ (note this particularly), so that the window would have been directly in the center as he wanted it.

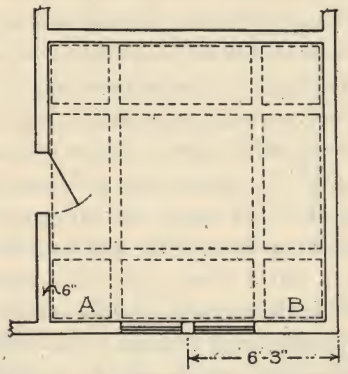


Fig. 111—Beamed ceiling in center with window.

Also look out for changing open fireplaces or any built in furniture. A case in point was a living room with a massive cobblestone fireplace—while the building was going on the owner decided to change to a brick fireplace, not so massive in proportions, etc. The matter was laid before the architect, who made a revised plan in which the different points were all taken into consideration, and the result was the same pleasing interior originally planned, but the dimensions of the cased openings, windows and ceiling beams, etc., had to be altered to do this. Remember all points have to be considered and do not make changes too quickly.

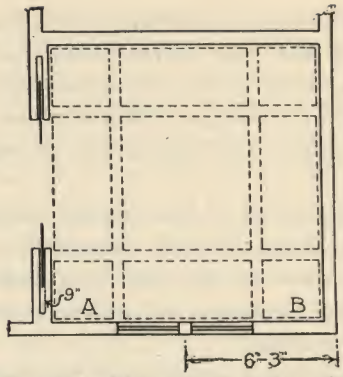


Fig. 112—Beamed ceiling out of center with window.

Taking Care of the Chimney.

Pay particular attention to the chimneys—sometimes a plan leaves the architect's hands with the chimney omitted on one or more floors; take care, too, that they are all in line. For some particular reason it is necessary to offset a chimney (to clear a hip or valley rafter for example). Look carefully where chimney comes thru on the different floors and measure the distance from its outside to the outside of the building; do not take an inside of the wall measurement or you are liable to make an error; remember that sometimes the thickness of

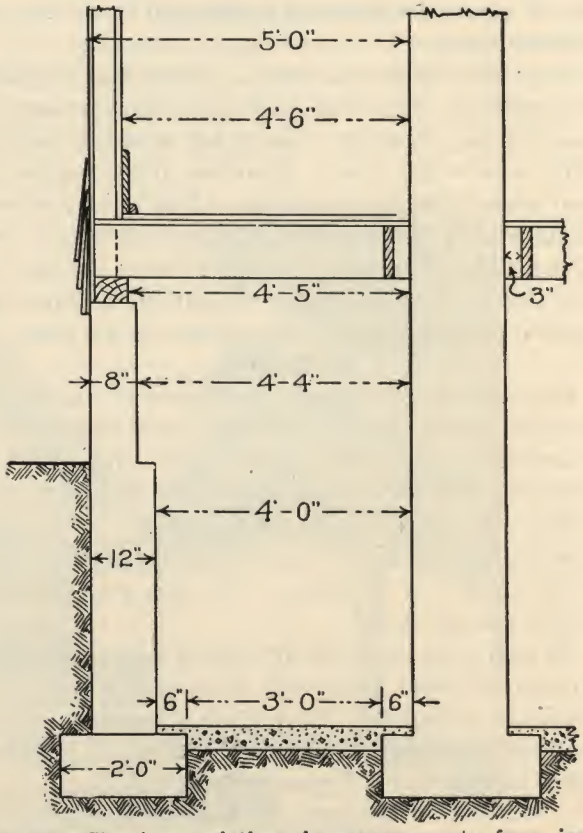


Fig. 113—Showing variations in measurements from inside of walls.

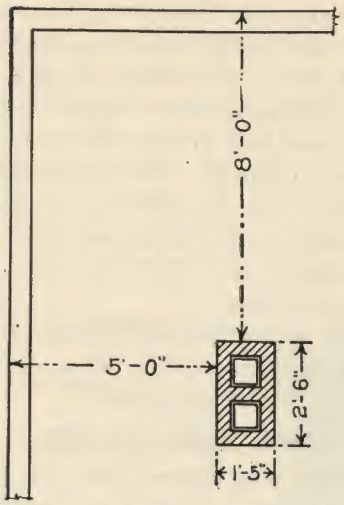


Fig. 114—Dimensions to chimney from outside of walls.

walls vary, in almost every case the foundation wall is thicker than the upper walls. In large cities the building laws for even small frame houses call for a 12″ foundation below grade, and 8″ above grade, and of course 6″ wall for frame house. This condition is shown in Fig. 113. Note all the different inside measurements in this section, and also note that the one 5-foot dimension from the outside applies at all points. If such dimensions are not given

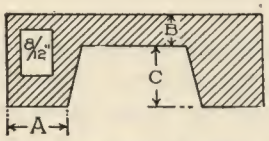


Fig. 115—Dimensions of open fireplace.

on the plan, place them there yourself as a guide, one each from the side and rear or as the case may be, as shown in Fig. 114.

When the Chimney Is Out of Place.

The chimney on the elevation is sometimes shown in the wrong place or the point where it comes out thru the roof is wrong. To be on the safe side, be guided by the floor plans, but also look at the elevations as it may be that an offset is required to clear a hip or valley rafter. When this is necessary the offset should be made at as easy an angle as possible so that there will be no shelf for the soot to collect upon. Whenever possible an offset in a chimney

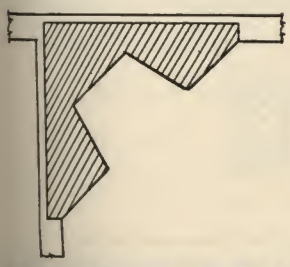


Fig. 116—Common method of showing corner fireplace.

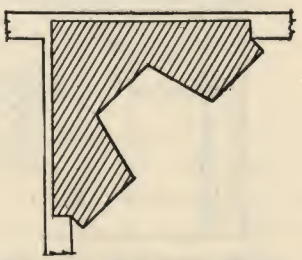


Fig. 117—How a corner fireplace should be built.

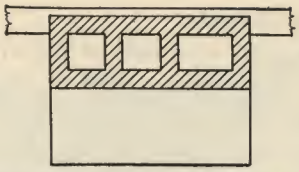


Fig. 118—Exposed brickwork.

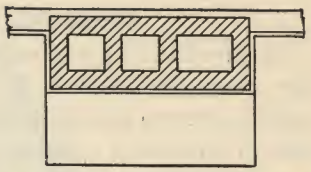


Fig. 119—Plastered brickwork.

should be avoided; it is better to cut away a common rafter and frame around the chimney where it comes thru a roof, but never cut a hip or valley rafter if it possibly can be avoided.

Checking Plans for Chimney.

Before starting the foundations look at the plans for the open fireplaces and see if they are large enough to hold the necessary flues. Frequently the furnace flue is run in the same chimney with that of the open fireplace. In Fig. 115 the least width of space of A would be about 16½ inches, the space B should be two bricks thick or about 8½ inches, the depth C should be at least 16 inches. If a cast iron dome is to be used be sure that the depth is enough for it to go in place.

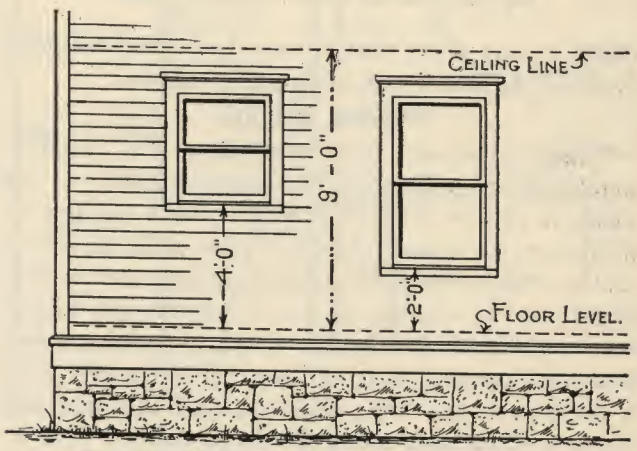


Fig. 120—Marking window height on elevation.

Corner fireplaces sometimes cause a little difficulty. They are often shown on plans like Fig. 116, but if built flush into the wall as shown they do not look well. They should project a little, as shown in Fig. 117. Just consider a corner fireplace as a straight one with the corners cut off.

Pay particular attention to the plaster lines around brickwork. Sometimes the brickwork of the chimney is exposed in the kitchen; in cases of this kind a face brick is employed for the exposed portion. In Fig. 118 the brick face of chimney is exposed and in Fig. 119 it is plastered.

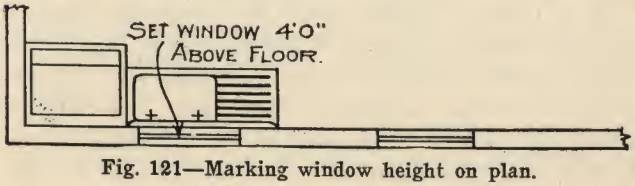


Fig. 121—Marking window height on plan.

Check Ceiling Heights.

Be sure that the ceiling heights are made as called for; remember that if the section is marked 9′ 0″ and the arrows are taken from the floor line to underline of plastered ceiling it means that for the distance between joists you must add the thickness of the lath and plaster and the floors, and be sure to note if it is a double floor. If you neglect this little

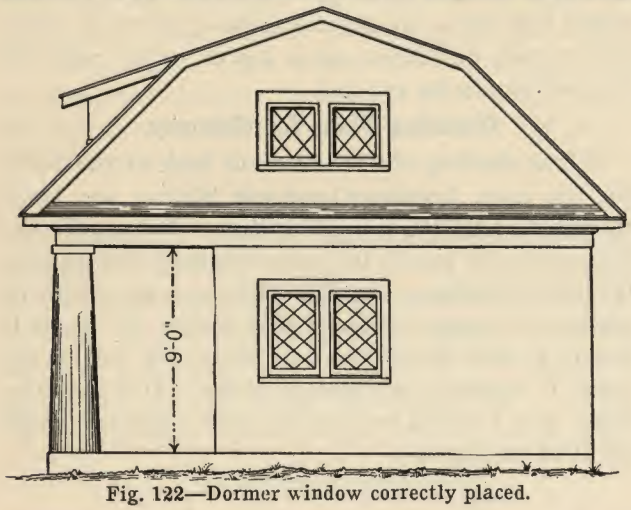


Fig. 122—Dormer window correctly placed.

detail it may mean that it cuts down the clearance between the stairs and ceiling at a landing.

Window Heights.

Take particular care regarding the window heights where a fixture is to be placed under it. An example of this is a sink placed under a window or a lavatory or a washtub, etc. Quite often an architect overlooks this little detail, but look out for this and raise the window or use a shorter one, whichever is decided upon by the owner or architect, but first call attention to it. It may be that a sink with a high back has been selected; find this out and place window high enough so as to clear.

If the architect has figured this out it usually will be marked on the elevation, like Fig. 120, or on the plan, like Fig. 121.

Framing a Porch Roof.

In framing a roof that comes down over the porch with a projecting dormer, be sure to scale the blue print, if dimensions are not given, to get the correct height for the plate over the outer ends of the porch. If the floor levels are not indicated on the elevation it will be better to mark these in yourself so that you will be sure to see how it will work out, so as to get the windows in at the height called for on the elevation.

Important Architectural Dimensions.

In a Dutch Colonial house the carpenter framed the roof without paying attention to the 9-foot distance plainly marked on the elevation for his particular attention, as shown in Fig. 122. The distance was made 10 feet. The result of his mistake is shown in Fig. 123. The dormers were set back and a shelf-like recess was made before the dormer—the particular point that both owner and architect wished to avoid. It was a very small mistake in not following one dimension but a mighty expensive one, as the entire roof had to come down and be put up to the correct distance. When this was done the windows came O. K., as called for in the plans and elevations, much to the astonishment of the carpenter, who declared it would not come right even tho it was on the plan.

Now, a plan is really the building made smaller, and what is possible on the plans can usually be worked out on the building itself.

Porch Facia and Soffit.

Quite often a plan shows that the facia of the house and the porch continue out in the same line as well as the water table of the house and the facia under the porch floor. Such a design is shown in Fig. 124. Now in actual work this porch cannot be carried out when a tapering column is used, either the soffit of the porch must be set back or the floor of the porch extended from the house—the reason for this will be clearly understood from an examination of Fig. 125. Just lay a straight edge on the facia line of the porch roof and it will be clearly seen that the base of the column and the porch floor project considerably; this is due to the tapering of the column.

In Fig. 126 part of the plan of a house is shown with the porch foundation in line with it; the soffit of the porch, however, is set back, as shown by the dotted lines. If the facia of the house and that of the porch roof is to be in the same line, without offset, the floor of the porch and its foundation must be extended as shown in Fig. 127; this shows the soffit of the porch by dotted lines.

Importance of the Soffit.

Where the column is of uniform section (not tapering) both the soffit of the porch and the foundation of the porch can be extended in the same line as the

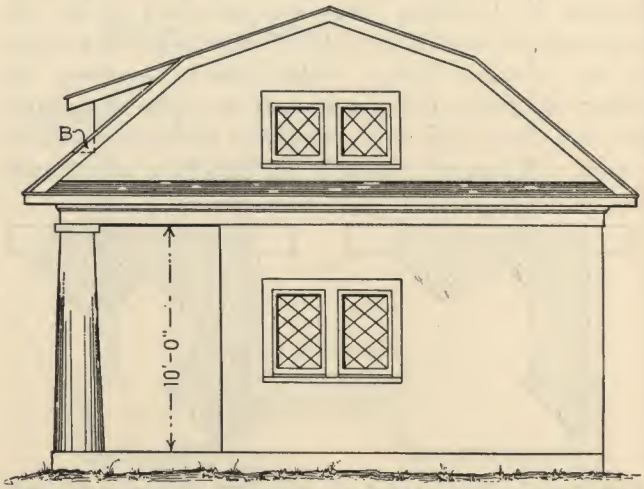


Fig. 123—Dormer incorrectly placed, due to wrong porch height.

house. Fig. 128 shows an example of this. The reason for this is that the width of the soffit should be the same width as the neck of the column and the center of the column and the center of the soffit should be in the same line. Most eyesores in porch construction are caused by mistakes in placing the soffit.

Cased Doorways.

Sometimes an architect will want a cased opening of regular doorway size but make a mistake and not mark in the door line. You should call attention to this so as to find out exactly what is wanted. In Fig. 129 in the left hand bedroom it is certain that the door was omitted by error, as it is necessary to have one in order to close the bedroom off from the hall. In cases like this ask the owner or architect. Unless it is marked "cased opening" or C. O., which of course would show that it is to be left open for some particular purpose, probably not to be used as a bedroom.

Quite often a window or door is omitted either on the plan or elevation; of course, it is to go in where marked, the same as if shown on both plans and elevations.

Misplacing the Stair Window.

Look out for the windows at stairways, sometimes they are shown on the plans so that when built they cannot be reached from the steps or platforms. Again the stairway will cross the window, etc. The safe way to do is to draw in pencil the width of the stairway direct on the blue print of the elevation, laying out each riser and numbering it so that you can follow each part and see its relation to the windows; also look out for the depth necessary for floor. See Figs. 130 and 131.

Look out for bay windows and window seats, these frequently have the window sills set at a higher distance from the floor than the other windows. We have known cases where a masonry wall had to be knocked down because of this.

When There Is an Obvious Oversight.

Do not quibble about an obvious oversight on the part of the architect. A case in point is shown in Fig. 132. Here just a half beam is shown over the space for bay window, which would be all right if there was an arch over the opening, but as nothing is marked it is only common sense to put a full beam across the opening and run a half beam all around just the same as if it was indicated on the plan as shown in Fig. 133.

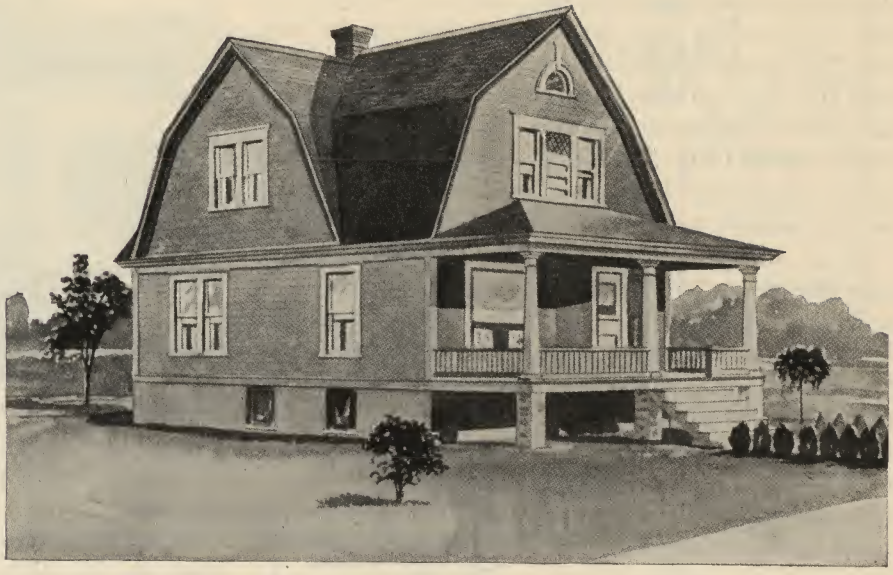
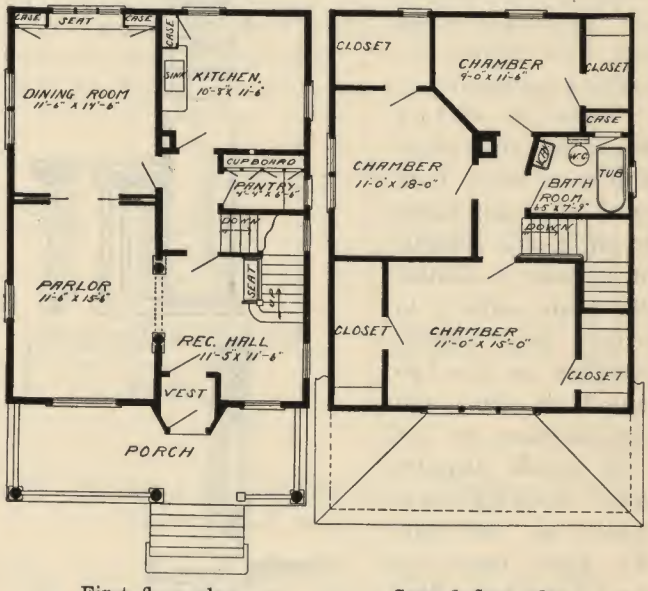


Fig. 124—Porch facia shown continuous.



First floor plan. Second floor plan.

Watch Out for Special Fixtures.

Look over the plans for the fixtures, particularly the bath tub, range, water tank, etc., to see if the doors or window openings are wide enough to get these fixtures in. If any fixture—the range, for instance—is to be supplied by the owner, find out its size before you go on with the construction of the house. If too large, get these fixtures in before the house is enclosed. There have been cases where part of a wall had to be removed to get a bathtub in, etc.

In one house an extra large range was bought by the owner and delivered when the house was

almost completed; it would not go thru any door or window opening, but had to be taken in thru the cellar, the floor joists had to be cut and the range hoisted into position in the kitchen, and the floor put back, much to the merriment of all the mechanics on the job; as the specification read "range to be supplied by owner but to be set up and connected by contractor," it had to be done at contractor's expense.

In the case of a large porcelain bathtub, get this into the house before the stairways are placed; it may save expense in ripping down partitions, etc. I have seen many cases where plastering has been knocked out, etc. Remember also that it takes room for the men to handle a bulky fixture, and a stairway with a few platforms is a hard place to carry up such an article without damage. It can be handled easily by hoisting it thru the wall before the stairs are placed.

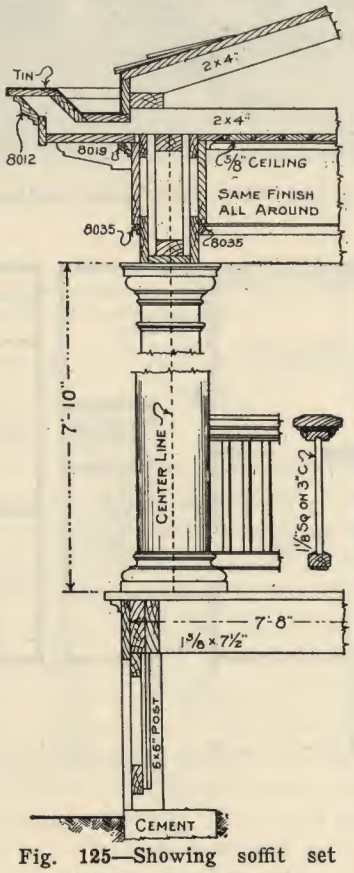


Fig. 125—Showing soffit set back from outer line of foundation.

When an extra heavy porcelain bathtub or a water tank is to be placed which is of heavy weight, it is wise to double the joists under it to carry the weight, whether so designated on plans and specifications or not—it avoids disputes and wrangling, which do not pay. In some cases we have known this cause to break the plastering of the ceiling below.

Allowing Space for Built-in Furniture.

Another thing to be noted and taken care of on a set of plans is room for the various fixtures going into the house, such as cupboards, water closets, washtubs, sinks, ranges, boilers, etc. See that enough space has been allowed for them. Too often only 2 feet is allowed for the tub in a bathroom, not enough room for the toilet and quite often not enough space in front of the toilet for leg room.

An example of this will be seen in Fig. 134, which shows a bathroom layout that looks all right, but it would be a very inconvenient bathroom on account of lack of room; the tub would be 30″ wide, the low down water closet 22″; this makes 52″ for fixtures out of a total width of 60″, leaving only eight inches between the tub and water closet. Another point is that there would not be enough room for the door to swing in. An oval lavatory would take too much room, as it needs at least 18″ space from the wall.

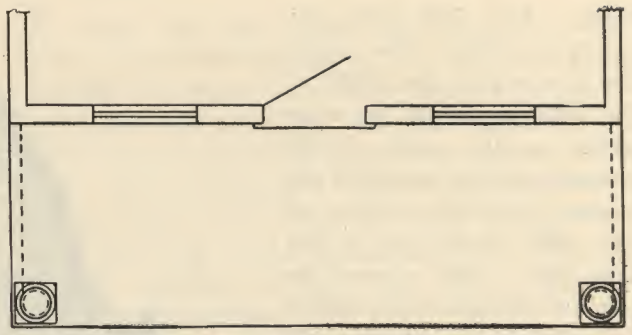


Fig. 126—Porch foundation in line with house, soffit set back.

In cases of this sort one is really "stuck" to know what to do. Of course the fault here may be attributed to the incompetence of the architect or the insistence of the owner that it will be large enough. Quite often the poor architect shoulders the blame when the fault is with the owner, and the architect is afraid to say an idea is impractical for fear of losing the job.

Making Headway.

Now, getting back again to the practical side of the subject, more space is needed and must be taken from the rooms on either side. If this is not possible the fixtures must be rearranged, perhaps smaller ones used. An arrangement which will work out is shown in Fig. 135. By simply setting the studs flat we can gain 2″ on each wall, and instead of having an 8″ wall we can make this into a 4″ wall for a distance of about three feet for a recess for the tub; this will enable us to gain 6″ in width and makes it possible to use a 5 foot tub. In close quarters like this a jog in the wall is permissible.

Water and Waste Pipe Lines.

Pay particular attention to pipe lines, water or waste. A 4″ soil pipe measures 6¼″ at the butts and therefore the least amount of room that is necessary to get this into is an 8″ partition lath and plastered, or if this would take up too much room

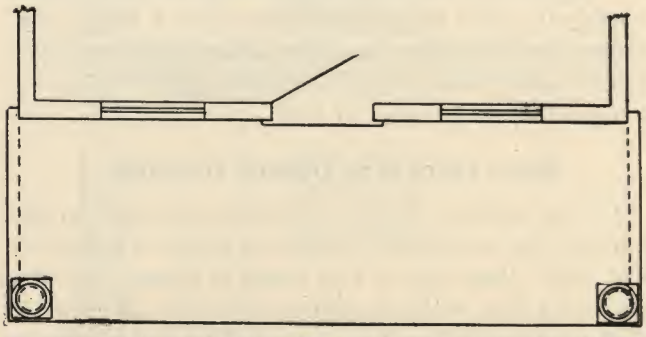


Fig. 127—Facia of house and porch in line; porch foundation projecting.

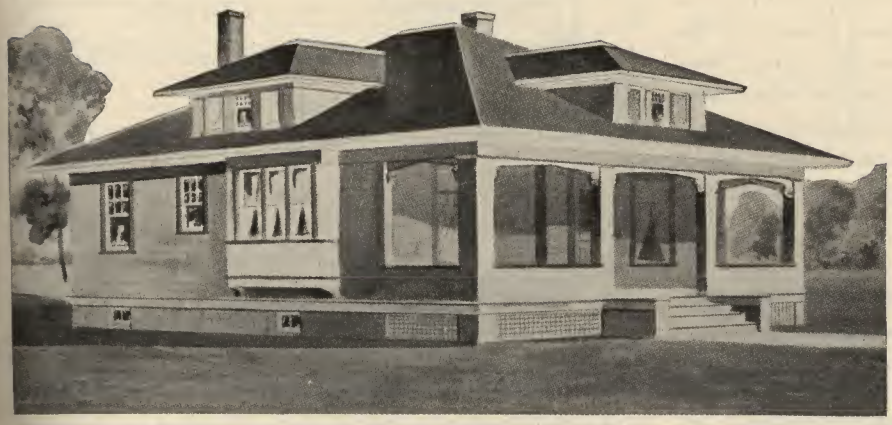
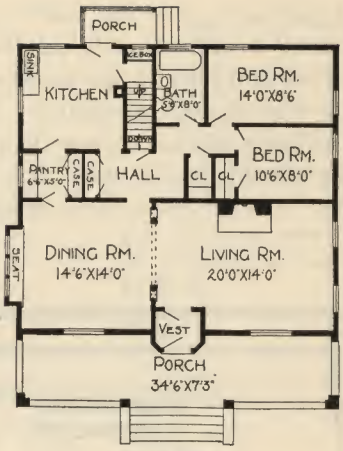


Fig. 128—House and porch in line, columns do not taper.

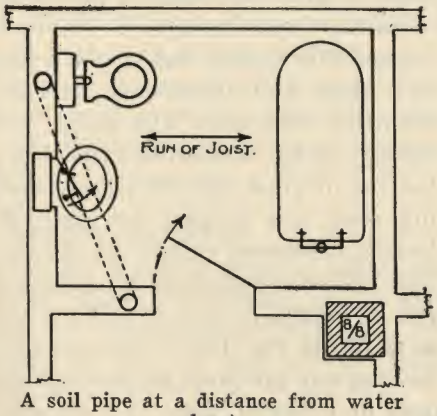


Floor plan.

the soil pipe should be boxed over. Look out, too, if pipe lines are shown to go down thru a header. The architect of quite a pretentious house made the error shown in Fig. 136; here it is out of the question to get the soil pipe in the partition shown. This difficulty was overcome by framing out the bathroom wall all along, so that the soil pipe was covered, as there was plenty of room—but the trouble was downstairs in the living room. This was remedied by blocking off both corners of the room and making a recess window as shown in Fig. 137.

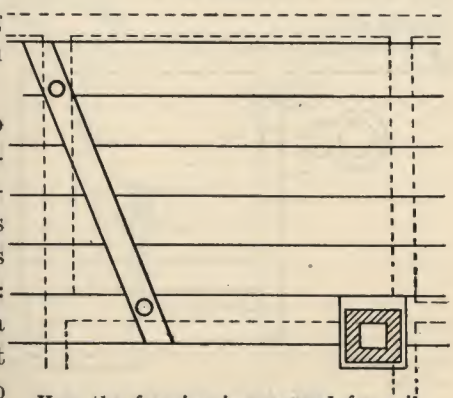
Trouble with the Soil Pipe.

More trouble occurs with the "stack" or soil pipe than with any other part of the plumbing; a good deal of cutting is always needed on the job, for hubs have a knack of coming at a header or against a wall. Chip out the foundation wall and cut the studs, etc., rather than have a "belly" in the wall. Avoid a jog wherever you can.



A soil pipe at a distance from water closet.

If you try to make the building accommodate the pipes something is going to be out: a window in a bathroom that was intended to be in the direct center may be to one side, a door that was planned to open full will hit the water closet, etc. If it looks as tho "it can't be done," just sit down and think it over, instead of rushing along to get the stack in any old way. Frequently such a little thing as making a crooked joint will gain the desired space; ofttimes the sawing off of each side of the hub will get the soil pipe in the desired space; sometimes the half inch counts.



How the framing is arranged for soil pipe.

Before beginning work measure the building carefully. It is not safe to rely entirely on the architect's plans, as frequently a wall is made a little thicker or thinner than the plan calls for. Also be sure of the heights of the various floors. Frequently these are different. Sometimes on the same floor there may be a difference of a few inches in the height due to some particular cause that developed during the erection; for instance it may be best to use 12 inch joists over a certain room of wide span, while for the other parts of the house only 10 inch are used.

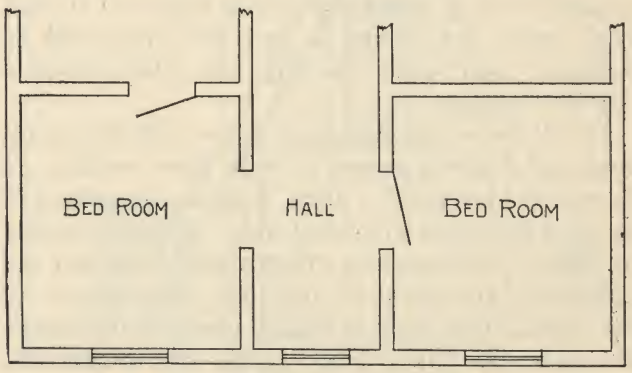


Fig. 129—Door omitted from plan

Upper floors have usually more area than the lower floors due to the walls decreasing toward the top. If this is not taken into account a riser that is about 4 inches away from a wall at the first floor level will be about 8 inches away at the second floor level.

Check Detail of Stair Measurements.

Before laying out the stairs from the plans it will

be well to look the matter over very carefully, as many errors are made with the stairs. Count out the treads and see if the distance from the top of floor to top of floor divided by the height of the risers will give one more riser than the number of treads—as should be the case. The next point is to see if the number of treads multiplied by the width of

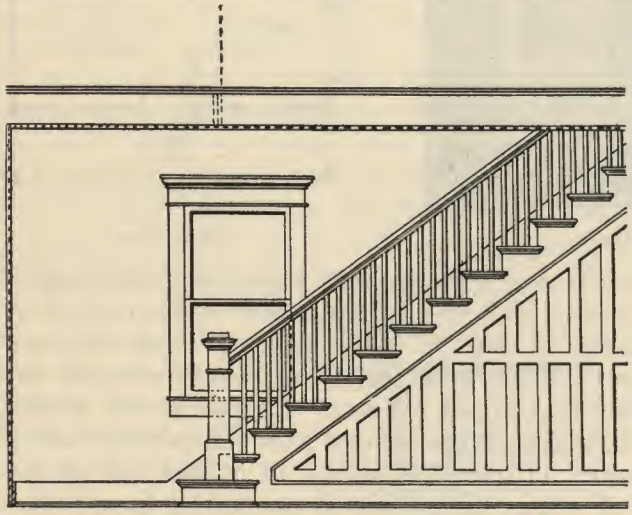


Fig. 130—Window set too low on stair.

treads given will fit into the space allowed for them without coming under the ceiling below; if it does come under the ceiling, be sure that there will be sufficient head room. See Fig. 138, which shows a case of this sort.

It will be seen readily there is not sufficient headroom for a grown person to walk down erectly. It is well to sketch out a little diagram like Fig. 138 to see if the stairs will be all right. There should be at least 6′ 6″ clearance. If this cannot be had the projection over must be bevelled off as shown by the dotted lines A, or a square corner taken out as shown by the dotted lines B, Fig. 138, or the well must be enlarged.

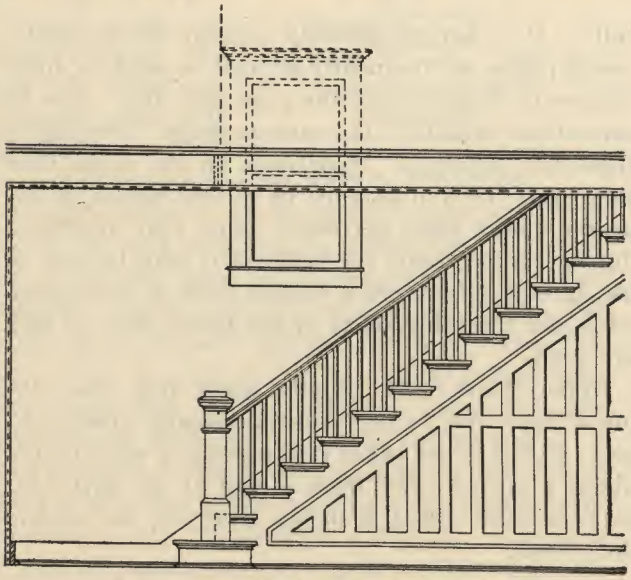


Fig. 131—Window set too high on stair.

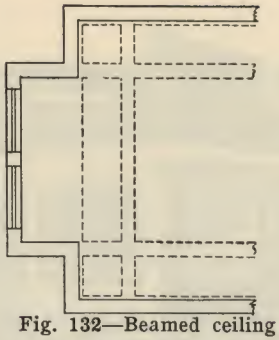


Fig. 132—Beamed ceiling incorrectly shown.

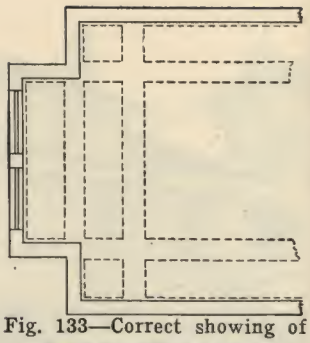


Fig. 133—Correct showing of beamed ceiling at bay.

Attic Stairs.

Another point to be guarded against is stairs at the outside walls leading to the attic. Too often the fact is overlooked that a little headroom is needed. Fig. 140 shows readily why the stairs planned as

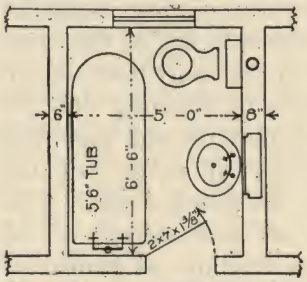


Fig. 134—An impracticable bathroom arrangement.

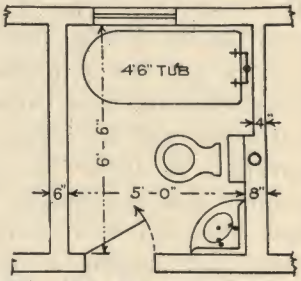


Fig. 135—A practical bathroom arrangement.

shown in Fig. 139 are an impossibility. A dormer would have to be added at X, as shown by the dotted lines, to give the required headroom.

As has been mentioned before, do not start to change this or that unless you compare all the relative plans and elevations. A case coming to our attention was when the plans called for a 9′ 6″ ceiling, and it was built with only an 8′ 6″ ceiling, but the original plan of a three riser platform landing stair was carried out with the result of not having headroom enough as shown in Figs. 141 and 142. What should have been done, if the well could not be enlarged, was to make a two riser platform as shown in Fig. 143. These are all little points, but looking out for them in the beginning saves a great deal of material, time and money; also perhaps it will avoid a lawsuit to fix the responsibility for the blunder.

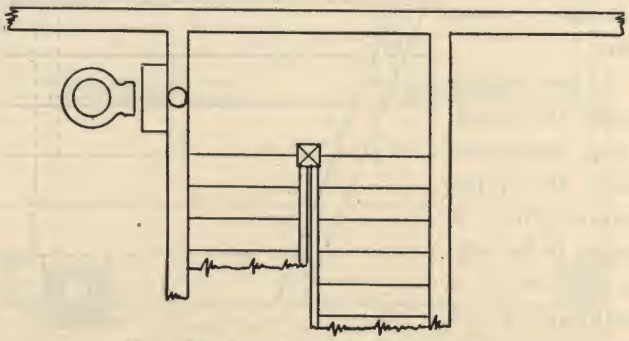


Fig. 136—Impractical soil pipe plan.

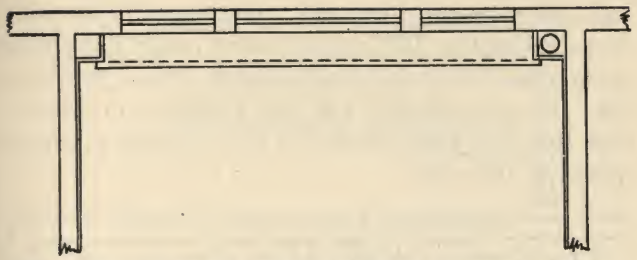


Fig. 137—Hiding soil pipe by making a recessed window.

Basement Stairs.

Particular attention should be paid to basement plans to see if there is plenty of room for the cellar stairs. An error frequently made by architects is to omit to make a recess in stone foundation for the stairway, the walls being carried around the same thickness. Figs. 144 and 145 show a cellar and first floor plan which it will be impossible to carry out. In a case like this it is necessary to recess the cellar wall so that a proper width of stair can be had. Fig. 146 shows how the cellar plan in Fig. 144 should have been drawn. Perhaps the reason is made more clear by an inspection of Fig. 147, which will show how impossible it is to carry out the plan shown in Fig. 144.

A stone foundation 18″ wide with a frame superstructure only six inches makes a difference of one foot in the width of the two stairs. If the inner stair is only 2′ 6″ wide the cellar stair will be only 18″ in width—too narrow for use. In a case like this the foundation wall in the recessed part should be laid of brick 8″ thick, as a stone wall of that thickness does not make a good construction.

In cellar plans where the architect has looked out for this detail, the first floor plan is usually like Fig. 147, and when you see this looked after you can follow the plans with confidence.

Handrail Problems.

If there is no detail of stairs given, see how the handrails are to be placed. Sometimes there isn't enough room left for the stairway well-hole, the trimmer beams are set too far over so that there

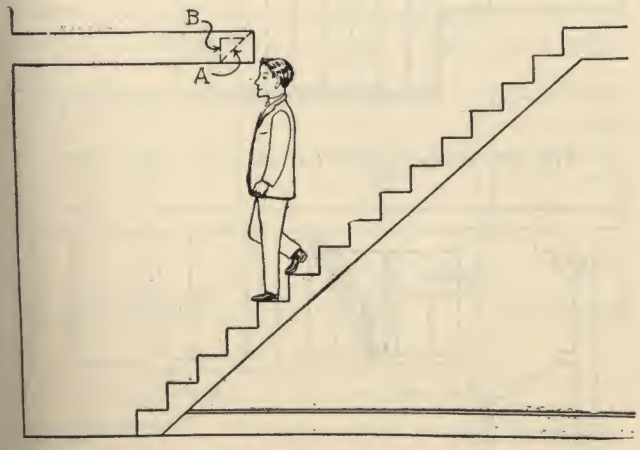


Fig. 138—Providing head room at stair well.

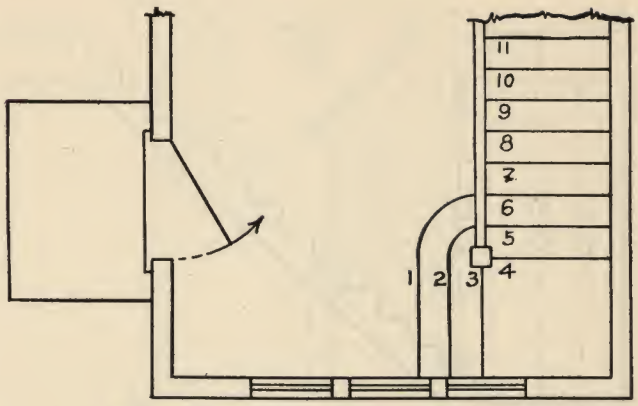


Fig. 139—Plan of entry hall with stairs.

will not be clearance enough for a handrail to go all the way up to the next floor, or in other instances the handrail dies or ends under the ceiling. Now this is poor work; a handrail should go all the way up to the second floor. Study this subject out carefully; you will never get any recommendation from

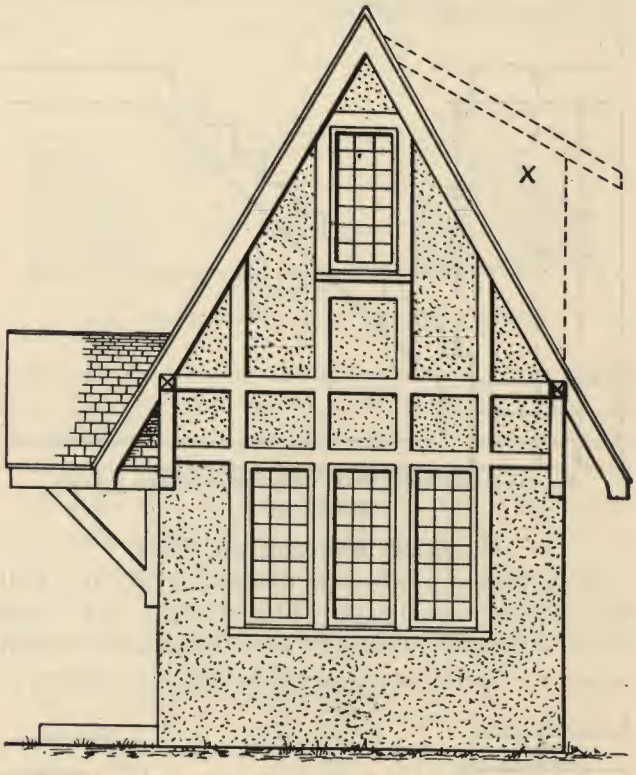


Fig. 140—Elevation of entry hall.

an old lady who has to walk down seven or eight steps before she can grasp the handrail. This condition occurs too often. Sometimes it is the fault of the architect, but more often it is the framers who are in error, as they do not allow enough clearance space for the handrail.

Fig. 148 shows a first floor plan with a three foot stairway and Fig. 149 the second floor plan; here the space is also marked three feet. This is a mistake. There should be more space, as it is an open

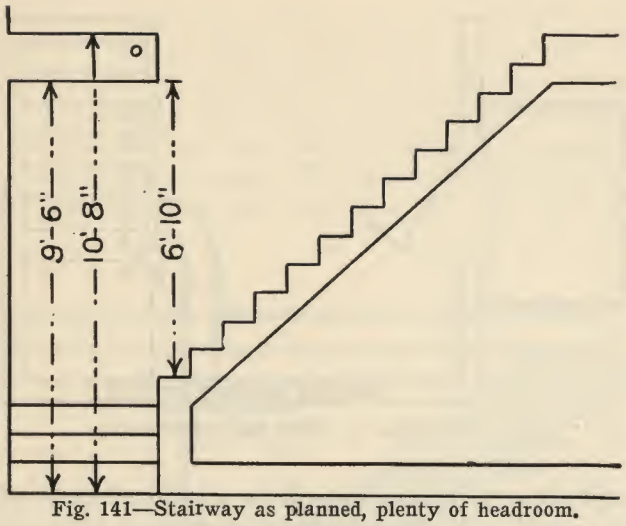


Fig. 141—Stairway as planned, plenty of headroom.

staircase and the handrail and baluster should continue up the second floor; 4 to 6 inches should be allowed, as shown on Fig. 150. If it is not on the plans be sure that you call attention to and allow for it, otherwise you will produce a staircase that will cause dissatisfaction.

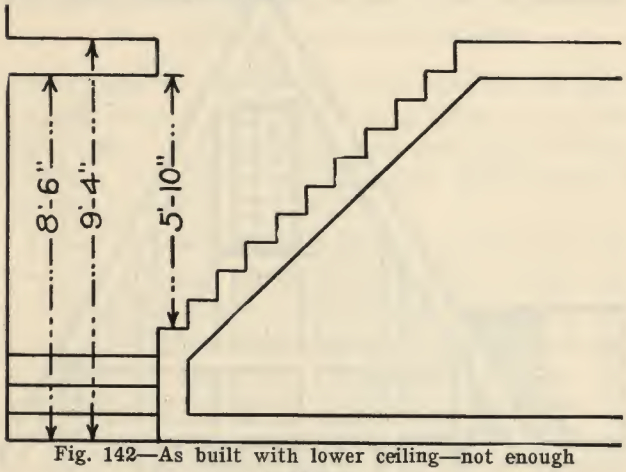


Fig. 142—As built with lower ceiling—not enough headroom.

Handrails Abutting the Wall.

On a platform where a handrail abuts the wall this is shown usually on a plan like Fig. 151. And it is a debatable question of how this should be fixed unless the specification mentions it has a rosette or half newel at the wall end. Of course if the plan shows it like Fig. 152, it is a rosette, and if illustrated as in Fig. 153 it is a half newel. If a plan like Fig. 151 is presented ask the architect or owner; then they can have no kick if the handrail is simply spiked to the wall.

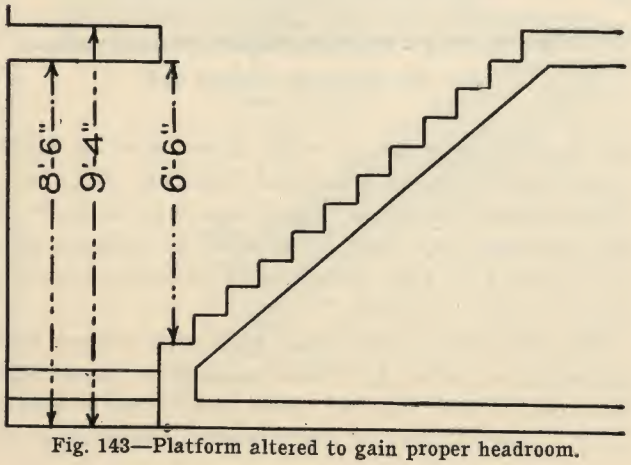


Fig. 143—Platform altered to gain proper headroom.

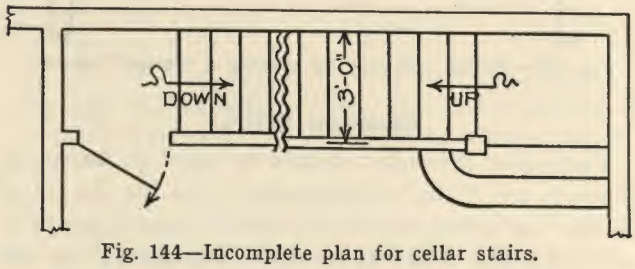


Fig. 144—Incomplete plan for cellar stairs.

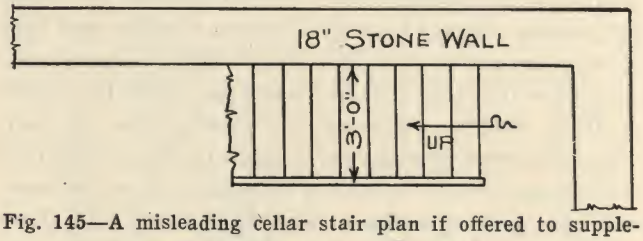


Fig. 145—A misleading cellar stair plan if offered to supplement first floor plan (Fig. 144).

Stair Platform Headroom.

Check plans carefully for headroom under a stair platform. Quite often a lavatory is designed to go under this and seemingly not enough headroom is allowed for it. It takes a little figuring to get this thing to work out; too often the architect does not give the detail of troublesome problems and it is up to the man on the job to solve it. Fig. 154 is an example of this sort; the ceiling beam was 9′, with 10″ joists, making the height from floor to floor 10′; there are 16 risers shown which are 7½″ high, and six down to the platform, or 45″ down from upper floor and 75″, or 10 risers, up from the lower floor. Now ordinarily flooring, joists and ceiling plastering of platform will take at least 6″, and this will leave only 69″, or 5′ 9″ headroom, which is entirely too

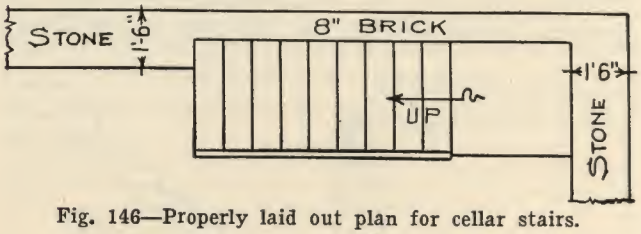


Fig. 146—Properly laid out plan for cellar stairs.

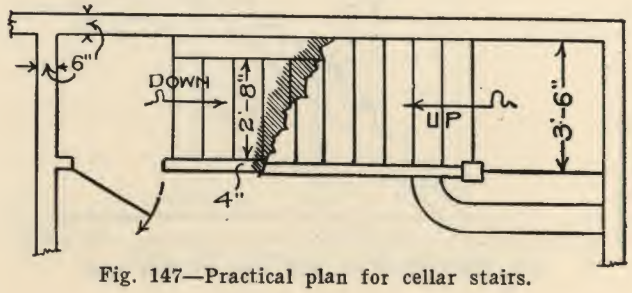


Fig. 147—Practical plan for cellar stairs.

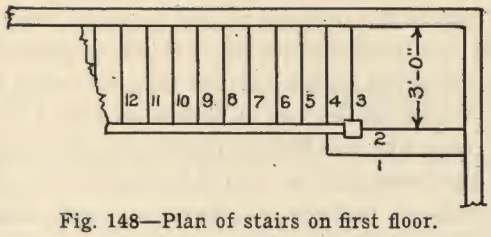


Fig. 148—Plan of stairs on first floor.

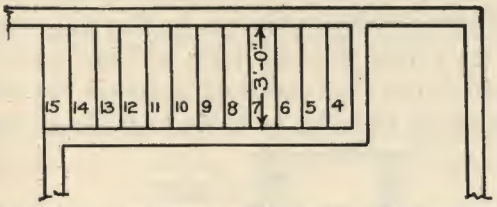


Fig. 149—Plan of stairs on second floor—no provision for handrail.

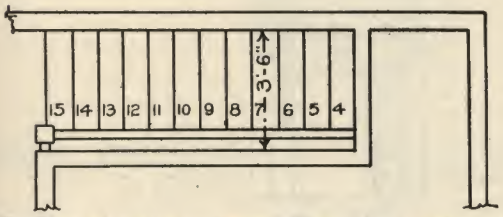


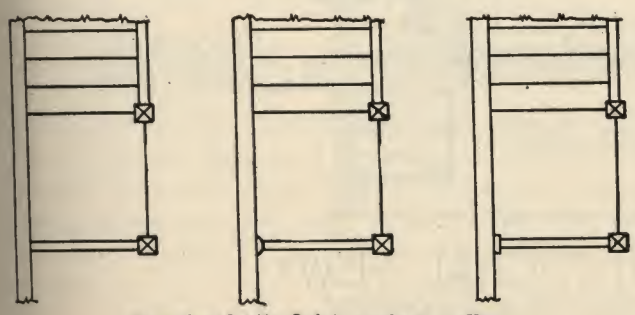
Fig. 150—Plan of stairs on second floor with proper space for handrail.

little. It is an obvious error on the part of the architect, but it is up to the mechanic on the job to work it out and get a decent stairway. Of course more height is needed and it can be had by putting diagonal steps, or winders, on the first platform "A." The headroom necessary will not allow it, but we have no trouble of this sort to put them in the upper platform. However, the owner wants this platform kept straight, and the distance "C" is fixed, so that the only thing to do is to change the height of the risers.

Risers and Treads.

Now we find that 15 risers of 8″ will do, so we omit one riser, making only five risers down, which gives us 80″; taking six inches off for floor, etc., actual headroom of 74″, or 6′ 2″.

This will do in a pinch, but it is not entirely satisfactory, as there are a number of people over six foot tall, so we must try to get a little more head-



How handrails finish against walls.

Fig. 151—Plain. Fig. 152—With rosette. Fig. 153—With half newell.

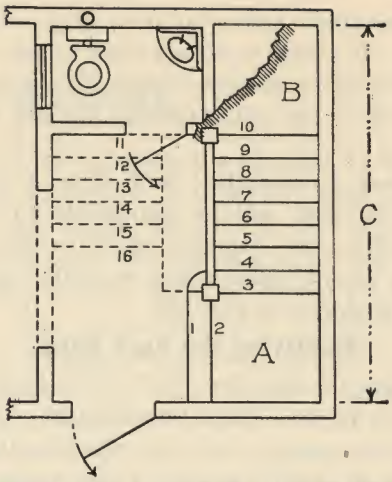


Fig. 154—A troublesome stair problem.

room. What can be done is to use 2x3 floor joists and put them 12″ apart. A stiff wood should be used—yellow pine or oak. A ⅜″ floor can be used if laid on a sub-floor; the latter can be cut in between the joists, and instead of lath and plaster use a ⅛″ wall board ceiling, as is shown in Fig. 155. All this will go in a space of 3½″, gaining 2½″, or making a total ceiling height of 6′ 4⅜″, which is quite a

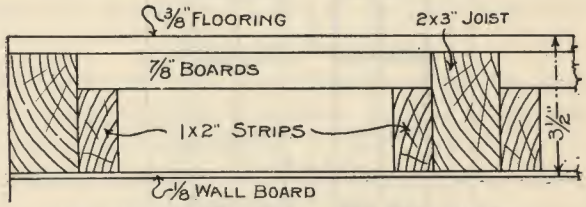


Fig. 155—A shallow floor for stair platform.

difference and makes the space usable. It is problems like this that test out the thinking power of the builder.

Half Timber Construction.

In cases like that illustrated in Fig. 140, where half timber construction work is shown, the outer rafter is supported on brackets; now it is understood in cases of this sort that there will be a blind or false rafter against the stucco wall and correspond-

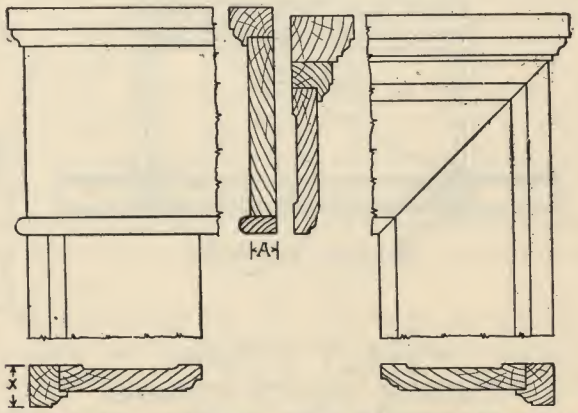


Fig. 156—Trim with back band too large for head nosing.

Fig. 157—How a wide back band can be used with a head-moulding.

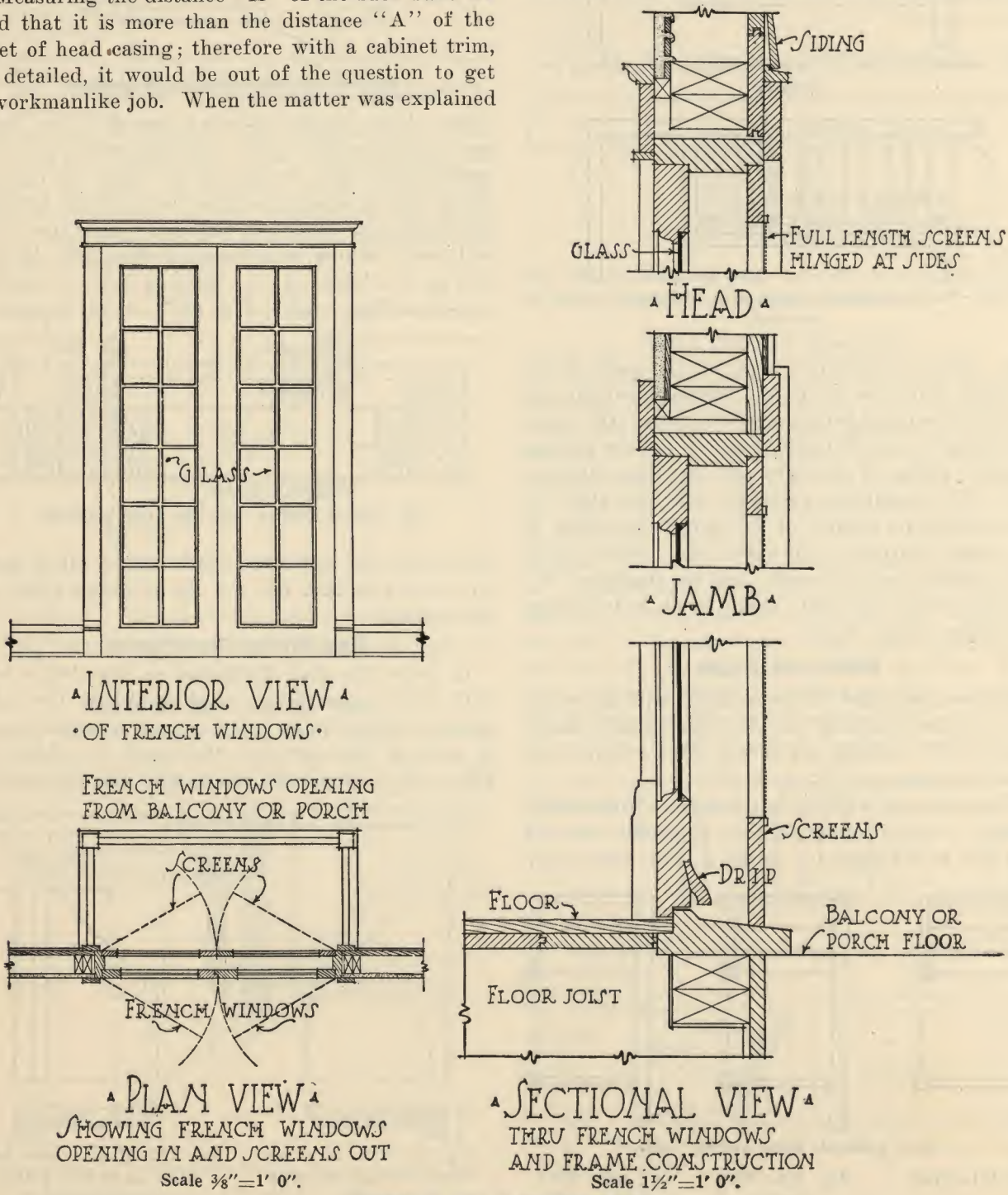
ing to the outside rafter so as to give a finished appearance. It would not look well to see the stucco go up directly to the roof when all the rest of the stucco work in the gable finishes against the timber work.

Sometimes an architect will show a back band on the trim that will be impossible to carry out satisfactorily. An example of this from a detail sheet of a set of plans which recently came to our attention is shown in Fig. 156.

Rectifying the Back Band.

Measuring the distance "X" of the back band we find that it is more than the distance "A" of the fillet of head casing; therefore with a cabinet trim, as detailed, it would be out of the question to get a workmanlike job. When the matter was explained to the owner he decided to use a mitre trim, as he wanted the back band trim, but we suggested that he get the effect of the cabinet trim by using a little crown mould on the top as shown in Fig. 157.

In a case like the above do not simply say that it would not work out or "can't be done," etc., but be able to give a remedy. It is not an easy thing for an architect to think out every little detail. He must imagine everything, while the builder and workmen have the actual material right at hand on the job. Remember this; the architect is human the same as others of us, and just as liable to make an error.



Details of pair of French windows.

CHAPTER XIV.

FIGURING THE LUMBER AND MILLWORK

[NOTE.—From the suggestions made and the instructions heretofore given it should now be possible to proceed with the actual work of making up a bill of materials for the lumber and millwork. If additional information is desired it can be secured by referring to the several chapters where detailed instructions are given, which appear later in this book.]

The first and important thing to do before making out a list of quantities, or bill of material, as it is

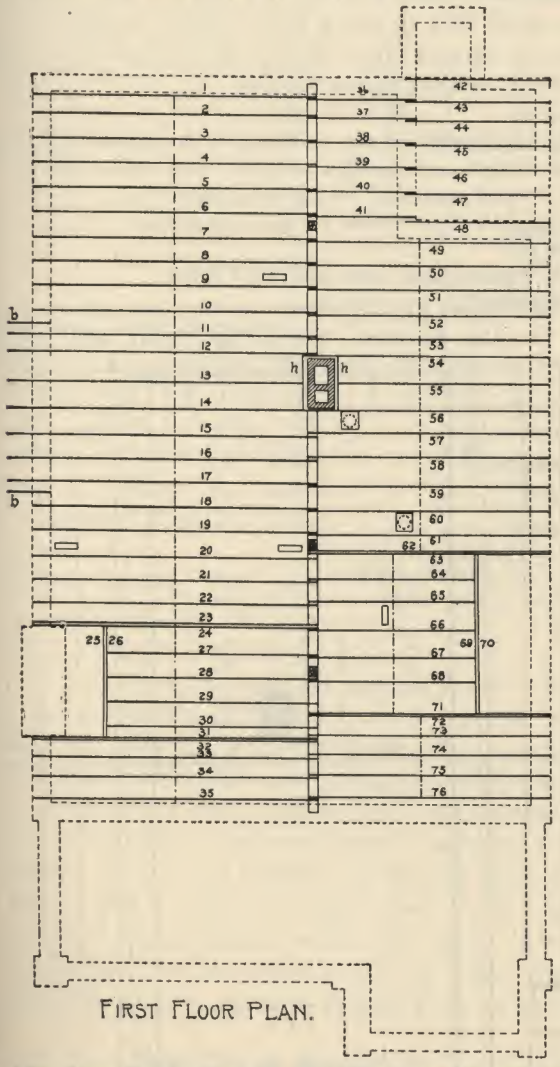


Fig. 158—Joist framing plan for bungalow shown in map insert.

commonly called, is to sit down and carefully look over the floor plans and elevations, read over the specifications and make comparisons of all related parts so that you will have in mind just what the building is going to look like and of what it will consist.

Form a "Habit" of Estimating.

In taking off the quantities get into the habit of having a certain way to go about it and stick to that method, so as to habituate yourself to one method. It will prevent your overlooking some items which would most likely happen if you are constantly changing your method of taking off the quantities. First you may start with the girders, then the post, next the sills, joists, studs, etc. On all plans follow the different items in the same rotation and it will impress itself on your mind and become easier for you, as it will become a habit—it will be your way of doing the work.

It will also be an aid if you have a check list of the different items entering into a building so that you can go over it and see if you have omitted anything. To aid the reader in this we give in a later chapter a check list suitable for ordinary home building operations.

Of course, if you are working on apartment houses, hotels, theaters, hospitals, etc., there will be many other items that must be taken into account, but you can, of course, make up your own check list. We give this one as an example of what you should have.

Rules for Estimating.

Follow out the order in which you make up your own check list, but as a guide we give below a good method to be followed:

Rule 1.—Measure the distance around the building on the outside and note it down. By the figure thus obtained you will be enabled to arrive at the sills, outside studs, foundation walls, sheathing, siding, belt courses, gutters, etc.

Rule 2.—Measure the height from the sill to the plate and note it down. By the figure thus obtained we are enabled to carry out the square measurements from the linear measurements obtained by the first rule.

Rule 3.—Measure the length of rafters and note same. By these figures you can obtain the number of feet in rafters, roof boards, number of shingles, etc. Figure out the roof area and mark it down in square feet.

Rule 4.—Measure the surface or area of the plan of the building. By this figure you will be able to arrive at the number of feet of flooring, linings, floor paper, number of feet of joist, bridging, etc. It is also a good plan to mark down separately the area of each room, hall, closet, etc., and also its length all around.

Rule 5.—Take off the lengths of the partitions, keeping each story separate. By these dimensions we arrive at the number of feet in studding and plates, base, mouldings, wainscoting, etc.

Rule 6.—Count up the doors and windows, also the number of sides of casings, pilasters, stools, aprons,

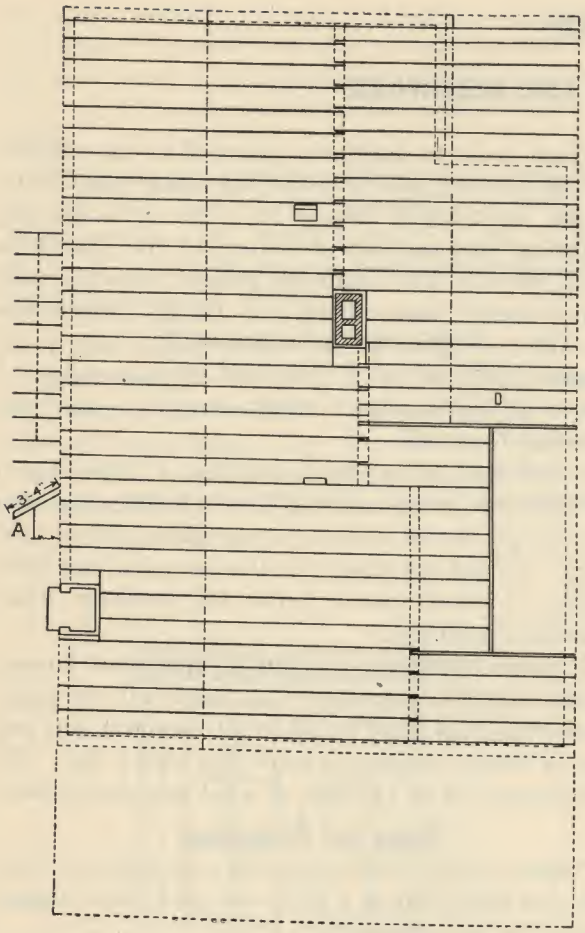


Fig. 159. SECOND FLOOR PLAN.

blinds, etc., and note the same for future reference.

Having set down the figures called for in these six rules the details can be worked out as below:

Taking Off Framing Plans.

A big help in taking off a timber list is to make a framing plan of the floors; this will show you exactly how many joists, headers, trimmers, hangers, rafters, etc., that will be needed. Take the blue print of the first floor plan and cover it with a piece of tracing paper or tracing cloth, also have the cellar plan handy for reference and trace the outline in pencil and mark in, at 16 inches distances as near as possible, the positions of the different joists, headers, etc. Figs. 158 to 160 show the framing plans for the complete set of plans shown in map insert and show how this is made. They are really self-explanatory, and but little need be explained about them, as they check up with the bill of material.

Applying the Rules.

Following out the above rules on map insert bungalow you will have:

(Rule 1)

28′ 0″ for width of building.
40′ 0″ for depth of building.
28′ + 40′ + 28′ + 40′ = 136 feet for the distance around the building.

(Rule 2)

19′ 6″ for the height from the sill to plate (of front and rear dormers).

(Rule 3)

25′ 6″ for length of main rafters, rear.
24′ 0″ for length of main rafters, front.
23′ 0″ for length of dormer rafters.
12′ 0″ for length of porch rafters.
792 square feet, area of roof, main section.
874 square feet, area of roof of dormers.
384 square feet, area of roof of porch.

(Rule 4)

826 square feet for area of main building.
252 square feet for area of front porch.

The area of the different rooms, etc., and their length all around is given in Figs. 161 and 162, and it is a good idea to mark these figures directly on the plan or make a little sketch of the floor layout and mark it on that for reference.

(Rule 5)

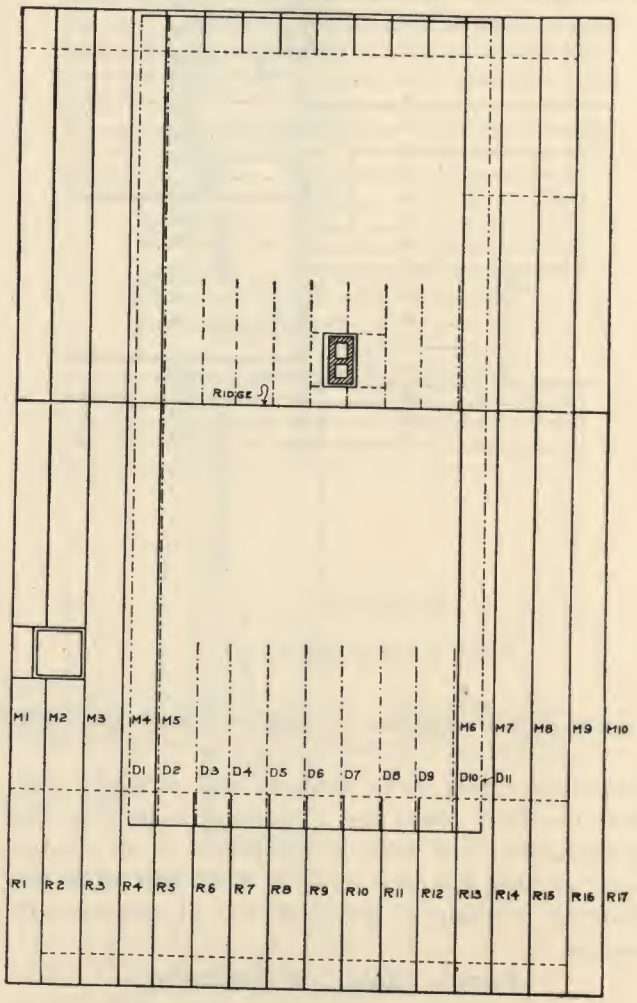
For the lengths of the partitions first measure those from front to back and then the crosswise ones; this gives:

91 feet of partition for the first floor.
112½ feet of partitions for the second floor.

(Rule 6)

The windows and doors are listed below.

Looking at the basement plan, you will measure off for the girders. From the front wall to the



ROOF PLAN.
Fig. 160.

chimney a 22-foot length is needed and from the rear of the chimney to the rear wall a 16-foot length is needed, and to hold up these girders three posts 7 feet long are called for.

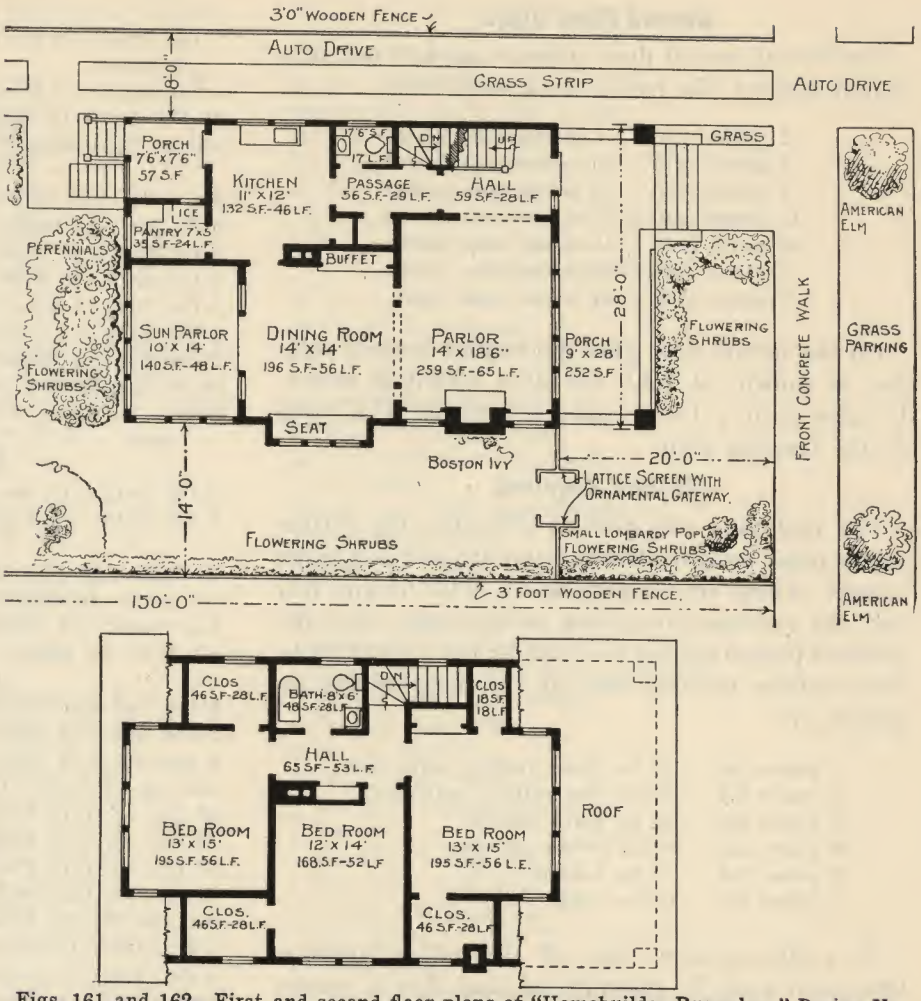
Estimating the Sills.

The next item is the sill; the all around length is 136 feet; from the section you will note that the sill is made up of 2x10″ pieces; therefore 272 linear feet are needed. A convenient length should be selected; now as the width of the building is 28 feet, a 14-foot length would seem convenient, and as the depth is 40 feet there is not much waste; this, then, would require 20 pieces of 2x10″ 14 feet long for the sill.

Number of Joist Required.

Looking at the framing plan for the first floor, Fig. 158, it is an easy matter to count off the number of joists and their lengths; of course the sizes were originally obtained from the section.

Referring to Fig. 158, note that a header of two 2x10 is used at the fire-place opening; these are numbered 25 and 26, and they are 6 feet long; the trimmers this header rests on are also doubled; see joists 23, 24, 31 and 32. The stairway well-hole also has headers and trimmers of doubled joists. Around the other chimney it is not necessary to double the joists, as only one joist is supported by the header. At the bay window the regular joists are 18″ longer, and at each end small joists "b b," are needed to get the projection to the right size. It will also be noticed that the hot air heating pipes come between joists and no framing around them is necessary.



Figs. 161 and 162—First and second floor plans of "Homebuilder Bungalow," Design No. 6605. Floor areas are marked S. F., meaning square feet, and L. F., linear feet.

See map insert for ¼″ scale plans of this house.

Joist List in Extenso.

Joists 1 to 10 are 15 feet long, requiring ten 16 feet.
Joists 11 to 17 are 17 feet long, requiring seven 18 feet.
Joists 18 to 24 are 15 feet long, requiring seven 16 feet.
Joists 25 to 26 are 6 feet long, requiring two 6 feet.
Joists 27 to 30 are 11 feet long, requiring four 12 feet.
Joists 31 to 35 are 15 feet long, requiring five 16 feet.
Joists 36 to 41 are 6 feet long, requiring six 6 feet.
Joists 42 to 48 are 7 feet long, requiring seven 8 feet.
Joists 49 to 63 are 13 feet long, requiring fifteen 14 feet.
Joists 64 to 68 are 9 feet long, requiring five 10 feet.
Joists 69 to 70 are 8¾ feet long, requiring two 10 feet.
Joists 71 to 76 are 13 feet long, requiring six 14 feet.
b and b are 2½ feet long, requiring one 6 feet.
h and h are 3 feet long, requiring one 6 feet.

Joist 55 is counted the same as if it was full length, as the others, 53, 54, etc.

Joist List Condensed.

Arranged according to sizes the above sums up as follows:

10 pieces 2x10 — 6 first floor joists.
7 pieces 2x10 — 8 first floor joists.
7 pieces 2x10 — 10 first floor joists.
4 pieces 2x10 — 12 first floor joists.
21 pieces 2x10 — 14 first floor joists.
22 pieces 2x10 — 16 first floor joists.
7 pieces 2x10 — 18 first floor joists.

The dot and dash lines represent a double line of bridging; this is of course given in linear feet. A good rule is to allow three feet for every foot of length of run of the bridging. As there is 68 feet of bridging it will take 68 × 3, or 204 linear feet of 1 by 3″ for the first floor bridging; for the second floor 60 feet of bridging is needed, which will take 180 linear feet, making a total of 384 feet required, or to be on the safe side, order 400 feet. There is always a quantity of small sized timber needed for blocking out by the plumber, electrician, etc., and figuring an extra quantity of material to different items will take care of this.

Second Floor Joist.

The list of second floor joists is worked out in a similar manner, the result being as follows:

2 pieces 2x10 — 8 second floor joists.
6 pieces 2x10 — 10 second floor joists.
9 pieces 2x10 — 12 second floor joists.
13 pieces 2x10 — 14 second floor joists.
20 pieces 2x10 — 16 second floor joists.
5 pieces 2x10 — 20 second floor joists.
7 pieces 2x10 — 24 second floor joists.

On the second floor plan the roof of the bay window is shown; at "A" the slant height is shown. It helps quite a bit to make a note like this right on the framing plan.

Rafters Required.

The roof plan will give no difficulty, the rafters on the outer ends are finished and are listed as verge boards. These are the rafters M1, M10, R1 and R17 and the corresponding ones at the rear. For the dormers planed rafters are used for the verge boards. Four rafters on each side of the dormers are required, or

8 pieces 2x6 — 24 for front rafters, main roof.
8 pieces 2x6 — 26 for rear rafters, main roof.
15 pieces 2x6 — 12 for porch rafters.
22 pieces 2x6 — 24 for dormer rafters.
2 pieces 2x6 — 8 for headers.
2 pieces 2x8 — 16 for ridge.

In a like manner take off the entire building. One point must be remembered, and that is waste; timber is usually sold in even feet lengths and an odd number may only be required, of course the next larger size must be used. Also bear in mind that the ends of the timbers need to be cut off to get a square end.

The complete list of the remainder of the lumber, millwork and hardware of this house is given in the list below.

9 Pcs. 2x4 — 20 Ceiling Joists.
22 Pcs. 2x4 — 16 Ceiling Joists.
136 Pcs. 2x4 — 14 Outside Studs.
44 Pcs. 2x4 — 14 Gable Studs.
26 Pcs. 2x4 — 6 Dormer Studs.
8 Pcs. 2x4 — 9 Bay Studs.
120 Pcs. 2x4 — 9 Inside Studs 1st Fl.
106 Pcs. 2x4 — 9 Inside Studs 2nd Fl.
1,400 Lin. Ft. 2x4 Inside and Outside Plates.
2,000 Ft. 1x6 Roof Sheathing.
18,000 Roof Shingles.
3,800 Ft. 1x6 Box Sheathing.
4,900 Ft. ½x4 Bev. Siding.
2,800 Ft. 1x6 Sub. Flooring.
3,400 Ft. 1x4 Finish Flooring.
15,000 — 4 Ft. Lath 1st and 2nd Floors and Basement Ceiling.
750 Lin. Ft. 1x1 Grounds.
100 Lin. Ft. 1x12 Shelving.
50 Lin. Ft. 1x3 Hook Strip.
60 Lin. Ft. 1x4 Ribbon.
250 Ft. 1x6 Byrket Patent Sheathing Lath.

Front Porch.

2 Pcs. 3x14 — 28 Roof Girders with ¼"x12" Steel Plate between.
4 Pcs. 2x12 — 10 Roof Girders.
21 Pcs. 2x6 — 10 Ceiling Joists.
300 Ft. ⅞x4 Beaded Ceiling.

Rear Porch.

1 Pc. 6x6 — 14 Post.
1 Pc. 2x8 — 18 Girder.
1 Pc. 2x10 — 18 Roof Girder.
1 Pc. 2x10 — 16 Roof Girder.
3 Pcs. 4x4 — 4 Newels.
4 Pcs. 2x10 — 4 Treads.
5 Pcs. 1x8 — 4 Risers.
96 Ft. ⅞x4 Beaded Ceiling.
Note: No Doors or Partition Material Figured for Basement.

Basement Stair.

2 Pcs. 2x12 — 16 Step Horses.
3 Pcs. 2x10 — 14 Treads.

Main Stair.

2 — 2x12 — 18 Step Horses.
2 — 1x12 — 18 String Boards.
4 — 1⅛x12 — 14 Treads.
5 — 1x8 — 14 Risers.

Outside Finish.

2 Pcs. 2x8 — 26 Verge Boards.
2 Pcs. 2x8 — 24 Verge Boards.
2 Pcs. 2x8 — 12 Verge Boards.
140 Lin. Ft. ½x1½ Porch Box Mould.
66 Lin. Ft. 1x12 Porch Box.
66 Lin. Ft. 1x10 Porch Box.
50 Lin. Ft. 1x10 Porch Box Soffit.
16 Lin. Ft. 1x4 Porch Box Soffit.
290 Lin. Ft. 1x8 Frieze.
5 Pcs. 1x4 — 18 Corner Boards.
5 Pcs. 1x5 — 18 Corner Boards.
12 Pcs. 6x6 — 6 Brackets.
750 Ft. ⅞x4 Beaded Planceer Ceiling.
150 Lin. Ft. 1x5 Outside Trimming.
75 Lin. Ft. 1x4 Outside Trimming.
120 Lin. Ft. 1x8 Watertable.
2 Pcs. 6x6 — 12 Bay Brackets.

Outside Millwork.

120 Lin. Ft. 2" Drip Cap.
400 Lin. Ft. 1¾ Bed. Mould.
400 Lin. Ft. ⅞ Cove Mould.
20 Lin. Ft. 1¾x3 Top Rail.
20 Lin. Ft. 1¾x3 Bottom Rail.
160 Lin. Ft. 1⅛x1⅛ Baluster Stock.

Interior Millwork.

1 — 3'0"x6'8"x1¾ Basement Door Frame.
4 — 3 Lts. 8x14 Basement Sash Frames.
1 — 3'0"x6'8"x1¾ Basement Door 5 Panel Painted.
4 — 3 Lts. 8x14 Basement Sash Glzd. D. S. A.
1 — 2'0"x7'6" and 1 — 3'0"x7'6"x1¾ Mullion Door Frames D. C.
1 — 2'10"x7'0"x1¾ Rear Door Frame
1 — 6'0"x7'6" Opening Jamb.
1 — 10'0"x7'6" Opening Jamb.
1 — 2'10"x7'0" Door Jamb.
1 — 2'6"x7'0" Door Jamb.
2 — 2'8"x7'0" Door Jambs.
2 — 2'4"x7'0" Door Jambs.
1 — 2'8"x6'6" Door Jamb.
3 — 2'8"x6'8" Door Jambs.
5 — 2'6"x6'8" Door Jambs.
1 — 2'0"x7'0" Mullion Door Jamb for 4 Doors with 2 Mullions.
1 — 3'0"x7'6"x1¾ Front Door Glzd. Plt. Gl. Div. 16 Lts.

1—2′0″x7′6″x1¾ Front Door Glzd. Plt. Gl. Div. 10 Lts.
4—2′0″x7′0″x1¾ Sun Parlor Door Glzd. D. S. A. Div. 10 Lts.
1—2′10″x7′0″x1¾ Rear Door 5 Panel.
1—2′10″x7′0″x1⅜ Inside Door 5 Panel.
1—2′6″x7′0″x1⅜ Inside Door 5 Panel.
2—2′8″x7′0″x1⅜ Inside Doors 5 Panel.
2—2′4″x7′0″x1⅜ Inside Doors 5 Panel.
1—2′8″x6′6″x1⅜ Inside Door 5 Panel.
3—2′8″x6′8″x1⅜ Inside Doors 5 Panel.
5—2′6″x6′8″x1⅜ Inside Doors 5 Panel.
1 Refrig. Door (See Owner for Size).
1 Clothes Chute Door and Jamb.
1—1 Lt. 24x60 Sash Frame for 5 Sash and 4 Mullions D. C.
1—1 Lt. 24x48 Trip. Sash Frame 2 Mullions D. C.
7—1 Lt. 10x48 Twin Sash Frames D. C.
1—1 Lt. 24x30 Mullion Sash Frames D. C.
4—1 Lt. 14x54 Twin Sash Frames D. C.
2—1 Lt. 18x30 Sash Frames D. C.
1—1 Lt. 24x30 Sash Frames D. C.
4—1 Lt. 14x16 Twin Sash Frames D. C.
4—1 Lt. 24x36 Sash Frames D. C.
1—2 Lts. 26x26 Triple Window Frame D. C.
1—2 Lts. 26x24 Mullion Window Frame D. C.
1—2 Lts. 26x24 Window Frame D. C.
1—2 Lts. 30x18 Window Frame D. C.
5—1 Lt. 24x60 Sash Div. 16 Lts. Glzd. D. S. A.
3—1 Lt. 24x48 Sash Div. 10 Lts. Glzd. D. S. A.
14—1 Lt. 10x48 Sash Div. 10 Lts. Glzd. D. S. A.
2—1 Lt. 24x30 Sash Div. 13 Lts. Glzd. D. S. A.
8—1 Lt. 14x54 Sash Div. 10 Lts. Glzd. D. S. A.
2—1 Lt. 18x30 Sash Div. 8 Lts. Glzd. D. S. A.
1—1 Lt. 24x30 Sash Div. 13 Lts. Glzd. D. S. A.
8—1 Lt. 14x16 Sash Div. 4 Lts. Glzd. D. S. A.
4—1 Lt. 24x36 Sash Div. 13 Lts. Glzd. D. S. A.
3—2 Lts. 26x26 Windows Top Div. 3 Lts. Glzd. D. S. A. C. R.
3—2 Lts. 26x24 Windows Top Div. 3 Lts. Glzd. D. S. A. C. R.
1—2 Lts. 30x18 Window Glzd. D. S. A. C. R.
1—14′0″ Wide Fireplace and Bookcases.
1—6′0″x7′0″ Buffet Selected by Owner.
1—3′6″x9′0″ Pantry Case Selected by Owner.
1—5′0″ Pantry Work Table.
1—10′0″x7′0″ Colonnade and Bookcases.
1—4′4″x8′0″ Wardrobe Design Selected.
1—3′0″x8′0″ Linen Case Design Selected.
1—8′0″ Dining Room Seat Hinged Seat.
2—20x24 Bev. Plt. Mirror Med. Case 3 Shelves.
The Above Cases to Be Complete with Hardware.
1—5″x5″ Starting Newel.
12 Ft. 1¾x3½ Top Rail.
120 Lin. Ft. 1⅛x1⅛ Baluster Stock.
60 Lin. Ft. ⅞ Cove Mould.

Trim for Parlor, Dining Room, Sun Parlor and Reception Hall.

340 Lin. Ft. ⅝x3½″ Casing.
124 Lin. Ft. ⅝x5″ Head Casing.
124 Lin. Ft. 1x1½ Head Mould.
124 Lin. Ft. ¼x⅞ Head Fillet.
64 Lin. Ft. 1⅛x3¾ Stool.
64 Lin. Ft. ⅝x3 Apron.
64 Lin. Ft. ⅝x⅞ Apron Cove Mould.
224 Lin. Ft. ⅝x4½ Pict. Mould.
200 Lin. Ft. ⅝x5½ Base.
200 Lin. Ft. ⅝x1¾ Base Mould.
200 Lin. Ft. ½x⅞ Base Shoe.
30 Lin. Ft. ¼x1¾ Door and Window Stop.
24 Pcs. 1x3½x8 Base Blocks.

Trim for Balance of House.

18 Lin. Ft. ⅝x5¾ Mullion Casing.
580 Lin. Ft. ⅝x3½ Casing.
200 Lin. Ft. ¾x4½ Head Casing.
88 Lin. Ft. 1⅛x3¾ Stool.
88 Lin. Ft. ⅝x3 Apron.
200 Lin. Ft. ½x1½ Pict. Mould.
450 Lin. Ft. 5¼ Base.
450 Lin. Ft. ½x⅞ Base Shoe.
66 Lin. Ft. ½x3 Chair Rail.
370 Lin. Ft. ¼x1⅜ Door and Window Stop.
56 Pcs. 1x3½x6 Base Blocks.

Sheet Metal Goods.

40 Ft. 3″ Ridge Roll.
80 Ft. 5″ Eave Trough.
12—5″ Eave Trough Hangers.
4—5″ End Caps.
4—5″x3″ Drop Outlets.
70 Ft. 3″ Conductor Pipe.
12—3″ Conductor Pipe Hooks.
6—3″ Elbows.
200 Pcs. 5x7 Galv. Iron Shingles.
5 Rolls Rosin Paper.
5 Rolls Tar Paper.

Hardware.

1 Pr. 4x4 Basement Door Butts.
1 Basement Door Lock Set.
4 Basement Sash Hangers and Fasteners.
1 Double Acting Door Hinge.
1 Pr. 5x7 Push Plates.
2 Pr. 4x4 Butts.
16 Pr. 3½x3½ Butts.
1 Double Door Lock Set.
1 Foot Bolt.
1 Front Door Lock Set.
1 Rear Door Lock Set.
14 Inside Door Lock Sets.
7 Sash Locks.
14 Sash Lifts.
48 Pr. 2½x2½ Casement Sash Butts.
60 Casement Sash Locks.
24 Base Knobs.
36 Coat and Hat Hooks.
3 Bundles Sash Cord.
24—6 Lb. Sash Weights.
4—5 Lb. Sash Weights.

Nails.

100 Lbs. 20D Common Wire Nails.
100 Lbs. 16D Common Wire Nails.
100 Lbs. 10D Common Wire Nails.
200 Lbs. 8D Common Wire Nails.
200 Lbs. 6D Common Wire Nails.
100 Lbs. 3D Galv. Shingle Nails.
150 Lbs. 3D Fine Lath Nails.
40 Lbs. 10D Casing Nails.
30 Lbs. 8D Casing Nails.
40 Lbs. 10D Finishing Nails.
30 Lbs. 8D Finishing Nails.
25 Lbs. 6D Finishing Nails.
10 Lbs. 4D Finishing Nails.

Other Materials and Labor.

To complete the list of quantities of this house we still need to know the figures for the excavation, masonry work, brickwork, plastering, sheet metal work, painting, plumbing, heating, lighting and grading. This would complete the house, but of course there are also certain general expenses in connection with every building operation that use time and material that cannot be put into a bill of

material but still nevertheless has to be figured on so that it can be priced and added to the estimate. Forms for concrete work and scaffolding use lumber, etc.

Definite, detailed instructions on many branches and phases of estimating are given on pages 192 to 219. This information is included as a matter of reference and will be found to be unusually complete and valuable.

In a manner there is a break in the theme of the story here, but it is desired to apply the instructions given to other than residence structures, hence follows the consideration of barns and other farm buildings.

When referring to the detailed instructions it may be noted that they are especially addressed to the contractor. The many suggestions given apply with equal force to all directly interested in a building enterprise.

FINDING A PLACE FOR SHORT LUMBER.

Selling short length lumber is not so easy as many have sought to make it appear.

The mere fact that framing and sheathing furnished by the dealer in lengths 10 feet and longer is reduced by the workmen to irregular lengths, 4 inches and longer, is no argument whatever.

If the length of each studding, cripple, joist, header, rafter and jack and hip rafter is taken from the plan, then the dealer is embarking in the ready-cut business and that cannot be conducted in a profitable way where each house differs from that of every other house for which material is supplied.

Methods of Framing.

Competent workmen do not waste material recklessly. Short pieces of dimension and sheathing are not buried under an accumulation of debris, but kept within reach and used as opportunity offers. So, on the score of economy, from this view there is little to be said.

The real point of interest in this entire question is to change the custom and initiate the practice of using short lengths where they can be employed without waste or loss of time.

Windows and doors in outside walls and partitions break up the solid studded walls. Doubling around all openings calls for the use of more framing lumber.

Some contractors set their studding regularly, 16 inches on center, regardless of the openings, which are cut in after the framing is up to the square.

In other cases the studs at the sides of the openings are doubled from sill to plate, and the spaces above and below the openings are filled in. The "cut-in" method requires slightly less material, but the other is regarded as the more substantial.

It is advisable, almost necessary, to follow method No. 1 to use short stock to advantage.

It should be said, also, that co-operation between the dealer and the contractor is essential to a practical solution of this question. The dealer cannot force the contractor to take the short stock, and the contractor, be he ever so anxious, cannot secure short lumber without the co-operation of the dealer.

The Price Question.

This question gains its importance from the fact that short lumber is cheaper, can be handled very easily and usually is of quality superior to that of the so-called standard lengths. The careful contractor is not wasting lumber for which he pays 3 cents a foot.

Locating Use for Shorts.

Going into this question in a practical way, it is necessary to find places in which a large number of short pieces of one length can be used to advantage, then to select the length that will serve without waste.

Let it be assumed that the method of framing by cutting in is used. In that even all studding headers and all spaces between sill and window stool and between top of window and the plate, must be filled with short pieces, whether they are furnished in short lengths or supplied in the regular run of studding.

In many homes the windows are of uniform width and set at the same heighth from the sill. It is an easy matter to count the openings, to measure the width, the distance from sill to stool and the distance from top of window to plate. With this information it is not difficult to determine the number of pieces of the several lengths that will be required.

In a bungalow 28 by 40 it requires 109 pieces 2 by 4 — 12 to stud the outside walls solidly. A careful calculation shows that to double at corners and around openings and to stud the blank walls would require 89 pieces of the same size and length.

Short Stock for Cut-ins.

In this case the headers range from 2 feet to 10 feet in length, while the short studding are 3 and 5 feet long, some of the windows being set high above the floor.

To supply the short cut-ins would require 48 pieces 2 by 4, 3 feet long, or 24 pieces 2 by 4, 6 feet long. Six-foot stock, also, would work well for the headers, one piece making two, one header for a wide and one for a narrow window.

Inside Partitions.

Inside partitions are solid except where broken by doors and cased openings. Usually the doors are all the same heighth on a floor and it is a simple matter to determine the length required over the openings, due allowances being made for plate and header.

Usually the contractor figures on enough scraps to fill in such places, but if the scraps give out or are not conveniently to hand, the workmen cheer-

fully cut into the old stand-by, 16-foot dimension, and the result is a leak that, with a little thought, may be stopped.

Collar Beams.

Almost without exception collar-beams are exactly the same length, and usually are very short, ranging from 2 to 4 feet. It needlessly increases the cost to supply standard lengths and have the workmen manufacture them on the ground.

A Suggested Method of Operation.

Most retail lumbermen have put in saw rigs for ripping and cross-cutting.

In most yards, also, there are miscellaneous assortments of short and broken stocks. It is entirely practicable to have such items as here have been enumerated, cut to exact length at the yard and delivered to the job ready for use.

Bridging, also, can be furnished in that way. Care must be taken to make proper allowance for sills, plates and headers, and for the difference between the commercial thickness and the actual thickness of 2-inch stock.

These are points which would naturally suggest themselves to practical men.

Sill Economy.

In a certain bungalow built a year or so ago, all basement windows extended through the sill into the frame part of the structure, that is, the windows were partly in the foundation and partly in the studding walls.

The frames were to be set after the studding walls were partly in the foundation and partly in the around the foundation wall, made of two pieces of 2 by 8, then cut out about 22 feet, linear length of sill to get in his windows.

Some of the material was used in the building, other parts were employed by the owner to kindle fires. In this case the value of about 60 feet of lumber was destroyed by sheer carelessness. In this case, also, a large number of pieces 2 to 6 feet long could have been employed instead of the longer lengths.

Short Length Sheathing.

It is the intention here to give general suggestions which may be applied to any building, rather than to submit a carefully compiled list of short lumber that could be used in the particular structure under review.

This problem must be worked out on a practical basis, with the idea of using as large a percentage of 4, 6 and 8 foot stock in framing and sheathing as possible, or consistent with economy in handling the work.

Sheathing for a Bungalow.

Referring again to our "bungalow": With one or two exceptions the windows were 5 feet 4 inches high. The spaces between openings, or an opening and an angle of the building, are here given:

1 section 4′	1 section 1′
1 section 4′	1 section 3′6″
1 section 3′	1 section 1′6″
1 section 6′	1 section 1′
1 section 4′	1 section 1′
1 section 1′	1 section 1′6″
1 section 2′	1 section 7′
1 section 2′	1 section 5′
1 section 1′	1 section 4′

That is the way it "takes off." Consolidated it gives:

An 8-foot length will cover a 7′ and a 1′ section.
A 6-foot length will cover the 5′ and one 1′ section.
A 6-foot length will cover the 3′ and two 1′6″ sections.

For the remainder of the short length sheathing 4′ stock may be used without waste. Added together the remaining gives seven 4′ sections, or 150 feet of 4′ stock.

Also, there are one 8′ and the equivalent of three 6′ sections, giving 96 feet of 6′ stock and 43 feet of 8′ stock.

It would be good practice, also, to include other 4, 6 and 8 foot sheathing, which can be employed to advantage in the gables and other short sections.

A Word of Caution.

Co-operation is essential to handling short lumber in a satisfactory way. A calculation can be made very quickly of the area of space to be covered, the usual allowances being made for loss in milling if matched stock or shiplap is used for the sheathing.

In addition to the definite quantities ascertained in this way, it is safe to add 10 to 20 percent to be worked in with the longer lengths without decreasing the strength of the structure or increasing the time required to do the work.

Usually there is a surplus of short lumber at the mill. The dealer has not cared to stock it because it is hard to sell. Contractors may or may not know of the existence of such stocks. Once appraised of that fact they will very quickly find it to their advantage to use increasingly large quantities of such lumber.

CHAPTER XV.

HINTS OF PRACTICAL VALUE TO THE LUMBER ESTIMATOR

Ordinary Lumber Waste.

In the use of ordinary lumber on walls, floors, ceilings, etc., the following percentages should be added to the actual measurement of the surface to be covered, in order to allow for lapping, matching, etc.:

Battens, 1x4, placed 6 in. on centers, only ⅔ of surface measure is needed.

Battens, 1x6, placed 8 in. on centers, only ¾ of surface measure is needed.

Ceiling will be same as flooring here given:

Flooring, 3-in. matched.....50%
Flooring, 4-in.....33%
Flooring, 6-in.....20%

Papers and felts are usually listed for enough less than the roll actually contains to allow for lapping.

Sheathing, common, laid horizontally on walls without openings.....10%
Sheathing, common, laid horizontally on roofs without openings.....10%
Sheathing, common, laid horizontally on dwellings with usual openings.....Nothing
Sheathing, common, laid diagonally on dwellings with usual openings.....17%
Sheathing, tight, 6 in., laid horizontally.....20%
Sheathing, tight, 8 in., laid horizontally.....15%
Sheathing, tight, 10 in., laid horizontally.....12%
Sheathing, tight, 6 in., laid diagonally.....25%
Sheathing, tight, 8 in., laid diagonally.....17%
Sheathing, tight, 10 in., laid diagonally.....12%
Siding, drop.....20%
Siding, lap, 4 in. to weather.....50%
Siding, lap, 4½ in. to weather.....33%

To estimate the quantity of sheathing or of shiplap, approximately, calculate the exact surface to be covered, deducting openings; then add the following percentages:

	Sheathing.	Shiplap.
For floors	1/7 or 15%	1/6 or 17%
For side walls	1/6 or 17%	1/5 or 20%
For roofs	1/5 or 20%	1/4 or 25%

Number of Feet Board Measure Required per Square, Allowing for Matching, etc.

8 in. shiplap.....116 ft.
10 in. shiplap.....125 ft.
2¼ in. face matched flooring.....133 ft.
3¼ in. face matched flooring.....125 ft.
5¼ in. face matched flooring.....120 ft.
6 in. beveled siding.....120 ft.
4 in. beveled siding.....133 ft.
6 in. drop siding.....120 ft.
8 in. novelty siding.....116 ft.

Number of Shingles and Lath Required per Square.

Shingles laid 4 in. to weather....1,000 per square
Shingles laid 4½ in. to weather.... 900 per square
Shingles laid 5 in. to weather.... 800 per square
Lath, per sq. yd..... 14
Per 100 sq. yds.....1,400

Treads and Risers for Stairs.

For general use in calculating the layout for stairs, the accompanying table will be found very handy and useful as a time-saver. The first row of

NUMBER OF RISERS	RISE OR RUN.															
1	6½	6¾	7	7⅛	7¼	7⅜	7½	7⅝	7¾	7⅞	8	8¼	8½	9	9½	10	10½	11
2	1'1	1'1½	1'2	1'2¼	1'2½	1'2⅝	1'3	1'3¼	1'3½	1'3⅞	1'4	1'4½	1'5	1'6	1'7	1'8	1'9	1'10
3	1'7½	1'8¼	1'9	1'9½	1'9⅞	1'10⅛	1'10½	1'10⅞	1'11¼	1'11⅝	2'0	2'0¾	2'1½	2'3	2'4½	2'6	2'7½	2'9
4	2'2	2'3	2'4	2'4½	2'5	2'5½	2'6	2'6½	2'7	2'7½	2'8	2'9	2'10	3'0	3'2	3'4	3'6	3'8
5	2'8½	2'9¾	2'11	2'11⅝	3'0¼	3'0⅝	3'1⅛	3'2⅛	3'2⅝	3'3⅛	3'4	3'5¼	3'6½	3'9	3'11½	4'2	4'4½	4'7
6	3'3	3'4½	3'6	3'6¾	3'7½	3'8¼	3'9	3'9½	3'10½	3'11¼	4'0	4'1½	4'3	4'6	4'9	5'0	5'3	5'6
7	3'9½	3'11¼	4'1	4'1⅝	4'2½	4'3⅜	4'4½	4'5⅜	4'6¼	4'7⅛	4'8	4'9½	4'11½	5'3	5'6½	5'10	6'1⅛	6'5
8	4'4	4'6	4'8	4'9	4'10	4'11	5'0	5'1	5'2	5'3	5'4	5'6	5'8	6'0	6'4	6'8	7'0	7'4
9	4'10½	5'0¼	5'3	5'4⅞	5'5¼	5'6⅜	5'7½	5'8⅝	5'9¾	5'10⅞	6'0	6'2¼	6'4½	6'9	7'1½	7'6	7'10½	8'3
10	5'5	5'7½	5'10	5'11¼	6'0½	6'1½	6'3	6'4½	6'5½	6'6½	6'8	6'10½	7'1	7'6	7'11	8'4	8'9	9'2
11	5'11½	6'2¼	6'5	6'6⅝	6'7½	6'9⅛	6'10½	6'11⅝	7'1¼	7'2⅜	7'4	7'6¾	7'9½	8'3	8'8¼	9'2	9'7½	10'1
12	6'6	6'9	7'0	7'1½	7'3	7'4½	7'6	7'7½	7'9	7'10½	8'0	8'3	8'6	9'0	9'6	10'0	10'6	11'0
13	7'0¼	7'3¾	7'7	7'8⅝	7'10¼	7'11⅝	8'1½	8'3⅜	8'5¼	8'7⅛	8'8	8'11¼	9'2½	9'9	10'3½	10'10	11'4½	11'11
14	7'7	7'10½	8'2	8'3½	8'5½	8'7¼	8'9	8'10½	9'0½	9'2¼	9'4	9'7½	9'11	10'6	11'1	11'8	12'3	12'10
15	8'1½	8'5¼	8'9	8'10⅝	9'0½	9'2⅝	9'4½	9'6⅝	9'8¼	9'10⅛	10'0	10'3¾	10'7½	11'3	11'10½	12'6	13'1½	13'9
16	8'8	9'0	9'4	9'6	9'8	9'10	10'0	10'2	10'4	10'6	10'8	11'0	11'4	12'0	12'8	13'4	14'0	14'8
17	9'2¼	9'6¾	9'11	10'1⅛	10'3¼	10'5⅜	10'7½	10'9⅝	10'11¾	11'1⅞	11'4	11'8¼	12'0½	12'9	13'5½	14'2	14'10½	15'7
18	9'9	10'1½	10'6	10'8¼	10'10½	11'0½	11'3	11'5¼	11'7½	11'9½	12'0	12'4½	12'9	13'6	14'3	15'0	15'9	16'6
19	10'3½	10'8¼	11'1	11'3½	11'5½	11'8⅝	11'10½	12'0⅝	12'3¼	12'5⅝	12'8	13'0½	13'5½	14'3	15'0½	15'10	16'7½	17'5
20	10'10	11'3	11'8	11'10½	12'1	12'3½	12'6	12'8½	12'11	13'1½	13'4	13'9	14'2	15'0	15'10	16'8	17'6	18'4
21	11'4½	11'9¾	12'3	12'5⅝	12'8¼	12'10⅝	13'1½	13'4⅜	13'6¾	13'9⅜	14'0	14'5¼	14'10½	15'9	16'7½	17'6	18'4½	19'3
22	11'11	12'4½	12'10	13'0½	13'3½	13'6¼	13'9	13'11½	14'2¼	14'5¼	14'8	15'1½	15'7	16'6	17'5	18'4	19'3	20'2
23	12'5½	12'11¼	13'5	13'7⅝	13'10½	14'1⅛	14'4½	14'7⅜	14'10½	15'1⅛	15'4	15'9½	16'3½	17'3	18'2½	19'2	20'1½	21'1
24	13'0	13'6	14'0	14'3	14'6	14'9	15'0	15'3	15'6	15'9	16'0	16'6	17'0	18'0	19'0	20'0	21'0	22'0
25	13'6½	14'0¾	14'7	14'10⅝	15'1¼	15'4⅜	15'7½	15'10⅝	16'1¾	16'4⅞	16'8	17'2½	17'8½	18'9	19'9½	20'10	21'10½	22'11
26	14'1	14'7½	15'2	15'5¼	15'8½	15'11½	16'3	16'6¼	16'9½	17'0¾	17'4	17'10½	18'5	19'6	20'7	21'8	22'9	23'10
27	14'7½	15'2¼	15'9	16'0⅝	16'3½	16'7⅛	16'10½	17'1⅝	17'5¼	17'8⅝	18'0	18'6¾	19'1½	20'3	21'4½	22'6	23'7½	24'9

Table giving number of treads or risers of any width for any size space.

figures running down the left-hand side represents the number of risers, while the first row running across the top represents either the rise or the width of the tread. Those in the following lines represent either the total rise or run for the number of risers shown in the opposite left-hand column.

Example—Suppose we wish the number of risers required in a stairway that is 10 ft. 5½ in. from floor to floor, and we desire to keep the risers as near 7½ in. as possible.

Take 7½ in the top line, and run down the column to the nearest figure to 10 ft. 5½ in. It is 10 ft. 7½ in., and is opposite 17 in the left-hand column. Therefore 17 represents the number of risers; but there is 2 in. left over. This must be divided into 17 parts, and one of these parts subtracted from each riser, which would be nearly ⅛ in. less than 7½ in.

Now look in the next column to the left. In this, the risers are 7⅜ in.; and for 17 risers, the total is found to be 10 ft. 5⅜ in., which is just ⅛ in. short. Thus the risers will be 7⅜ in., plus 1/17 of ⅛ in.

To find the run of the stairs, it must be remembered that there is always one less tread than there are risers. So take 16 in the left-hand column, and trace the figures to the right till you come to the column whose figures at the top represent the desired width of tread. Suppose it to be 9 in.; then it will be found that the run will be 12 ft. If the treads are 9½ in. wide, then the run will be 12 ft. 8 in., and so on for any desired width of tread. Usually there is some leeway in the run; that is, it is not confined to a certain space like the rise from floor to floor. Therefore, a few inches in the run of a straight flight of stairs does not usually make any difference, thus leaving it to the builder to select at once the width of tread desired. When this cannot be done, then the allotted space must be arrived at in the same manner as that given in the above for the risers. But after all, it should be remembered that, while the measurements can be accurately found by the aid of this table, its greatest utility is as a quick reckoner, in laying out the space and proper openings for the finished stair work. In that case it is not necessary to calculate down to the minuteness required in the building of the stairs.

One of the problems that often comes up in building construction is how many shingles are needed to cover a given area of roof or side wall when they are placed 6 inches to the weather, etc.

Now shingles come in bundles of 250 and are usually 16 or 18 inches long but (unless they are dimension shingles) they vary in width, the average being 4 inches, hence one bundle will lay one course 1,000 inches long.

For example: find the number of shingles required to cover a plain sloping roof 20 feet long and 10 feet wide, when the shingles are to be laid 4 inches to the weather.

Each row of shingles will be 20 feet $\times$ 12 inches = 240 inches long. As they are 4 inches apart it means that 12 $\div$ 4 = 3 layers of shingles are required for each foot of width or a total of 3 $\times$ 10 = 30 layers of shingles.

Now 240 $\times$ 30 = 7,200 inches is the total length of all the layers of shingles, and dividing this by 4 (the average width of a shingle) gives 7,200 $\div$ 4 = 1,800 shingles required.

This, of course, is the exact number but now in practical work the starting courses are always laid double and there is more or less waste. For the starting course we need 240 inches more, or 60 shingles additional, or a total of 1,860 shingles, or reducing it to bundles as they would have to be ordered, we have 1,860 $\div$ 250 = 7 $\frac{11}{25}$ bundles; now allowing a little for waste we may say practically that it would take 8 bundles of shingles to cover the 20x10 foot area.

Of course where figures like this are often to be used it is best to have a table worked out so that it will be handy to refer to. Now to cover 100 square feet will take:

900 shingles if laid 4 inches to the weather
800 shingles if laid 4½ inches to the weather
720 shingles if laid 5 inches to the weather
655 shingles if laid 5½ inches to the weather
600 shingles if laid 6 inches to the weather

Framing timber, etc., is sold at so much "per thousand." This means a thousand feet board measure. Now a foot, board measure, is a piece of wood 12 inches square and 1 inch thick or in other words 144 cubic inches. This is the unit of measuring, but the block of wood may be any size, and if it contains 144 cubic inches its contents is referred to as a board foot, thus a block of timber 12 inches square on the end, and 1 ft. (12 in.) long, would contain 12 board feet. A simple rule for finding the number of board feet in a piece of timber is to multiply the end dimensions together, divide this product by 12, and multiply this answer by the length of the piece in feet.

Thus, a 2 by 12-in. joist 16 ft. long would contain

$$\frac{2 \times 12}{12} \times 16 = 32 \text{ board feet.}$$

The following table gives the number of board feet in 1 ft. of length of common sizes of timber.

Board Measure per Linear Foot of Length for Different Sizes of Timber

End Size, in Inches	Feet, Bd. Measure	End Size, in Inches	Feet, Bd. Measure	End Size, in Inches	Feet, Bd. Measure
1x2	.17	1¼x10	1.04	3x8	2.00
1x3	.25	1¼x12	1.25	3x10	2.50
1x4	.33	1½x2	.25	3x12	3.00
1x5	.42	1½x3	.37	3x14	3.50
1x6	.50	1½x4	.50	4x4	1.33
1x8	.67	1½x5	.62	4x6	2.00
1x10	.83	1½x6	.75	6x6	3.00
1x12	1.00	1½x8	1.00	6x8	4.00
1x14	1.17	1½x10	1.25	8x8	5.33
1x16	1.33	1½x12	1.50	8x10	6.66
1x18	1.50	2x4	.67	8x12	8.00
1x20	1.67	2x6	1.00	10x10	8.33
1¼x2	.21	2x8	1.33	10x12	10.00
1¼x3	.31	2x10	1.67	12x12	12.00
1¼x4	.42	2x12	2.00	14x14	16.33
1¼x5	.52	2x14	2.33	16x16	21.33
1¼x6	.62	3x4	1.00		
1¼x8	.83	3x6	1.50		

Lumber of any given width may be calculated from the table by adding together the board measure in two other sizes of the same thickness of material. For instance, a 2x16-in. timber will contain twice as many board feet as a 2x8-in. piece, or as much as a 2x12-in. and a 2x4-in. taken together.

CHAPTER XVI.

FIGURING A BARN BILL

Plans for a barn may reach the dealer or the contractor in any stage of completeness. If the plans themselves are complete, with detail of all necessary parts, they may not be accompanied by specifications.

It is wise to take all the information the plans contain and to reach out after such other and further data as may be procured from the prospective builder.

It is important in making out your bill to specify grades and equally important that competitors figure on the same qualities of material. Otherwise there is no parity to the figures and they cannot be competitive in the true sense.

The drawings for the barn illustrated in the map insert show floor plan, cross section, side and end elevations and side and end framing. All are valuable and necessary and all must be consulted to get at the quantities of material required to construct the barn.

In following this process the reader should bear in mind that every mental move in the work cannot be described in detail. In some, probably in most cases, the result rather than the process, is given.

Footings and Foundation.

To get at the quantity take the cross section and the floor plan. Footings are 1 by 2 feet, wall 1 by 3 feet 4 inches. Total distance around barn 184 feet, multiplied by 5 feet 4 inches gives 1,349 cubic feet.

For the silo and feed room, figure the total length at 18 plus 50, equals 68, multiply by 3, the height, and divide by 2, as 6 inches is sufficient for this wall. This gives 102 cubic feet. The depth, of course, will be regulated by the character of the soil.

The cross section shows two tiers of footings under the barn. These are 2 feet wide and 1 foot 6 inches deep. Doubling up gives a block 2 feet wide by 3 feet high, 54 feet long, or 324 cubic feet.

For the barn floor the space is 34 by 64 and this may be figured at 6 inches deep, gives a total of 918 cubic feet.

Feed room and silo floor may be approximated as 14 by 20 feet, by 6 inches deep, or 140 cubic feet.

Proper allowance should be made for the difference between dry and mixed cubical contents of the materials, and the quantity required then figured by the formula to be used, one-two-three, or one-three-five, as the case may be. Allowance, also, should be made for the top coat or wearing surface.

Sills, Plates, Girders.

This information may be obtained from the cross section, the fact that the sills and plates continue, in some cases, across the ends being assumed.

Four pieces of 2 by 10 are required for sills and plates at each side, making eight pieces in all. Fourteen foot stock may be used without waste, requiring four pieces to make a length, or 32 pieces in all.

For the sills eight pieces 2 by 12 — 12 feet will be required; for the end plates eight pieces 2 by 10 —12 and four pieces 2 by 10 — 14. On the ends the doors cut in and reduce the quantity of material required for the sills.

Windows, Doors, Fresh Air Inlets.

An examination of the barn floor shows 20 sash, 9 lights 8 by 14 are caled for, and these will take twenty sash frames. There are three doors in each end. These are 4 by 8 feet and frames must be provided for them, a combination frame as it sits partly in the frame and partly in the concrete wall. Three of the doors are sliding doors and three are swung, facts which must be borne in mind.

Studding.

The barn story is framed from the top of the foundation to the underside of the floor joist. Examine the framing details and information on the number of studs, braces and cripples may be secured. In the side framing details two or four sections are shown. Counting the full length studding carefully, allowing for doubling, as shown, gives a total of 136 pieces 2 by 10, 4 feet 4 inches, for the sides and 40 pieces for the ends.

The stud braces on the sides call for 16 pieces 2 by 10, 4 feet 8 inches long.

Headers for the sides call for 16 pieces 2 by 10 3 feet long; cross braces, for 8 pieces 2 by 10, 5 feet long.

In addition to the end studding 6 pieces 2 by 10, 4 feet long, will be needed for door headers, 2 pieces 2 by 10, 10 feet long, for cross braces, and 4 pieces 2 by 10, 3 feet long, for window headers. Some of these are not shown.

Joist.

From the cross section you can secure the spans for the joist. There are three tiers, spaced 2 feet o.c., two tiers 12 and one tier 14 feet long. That means

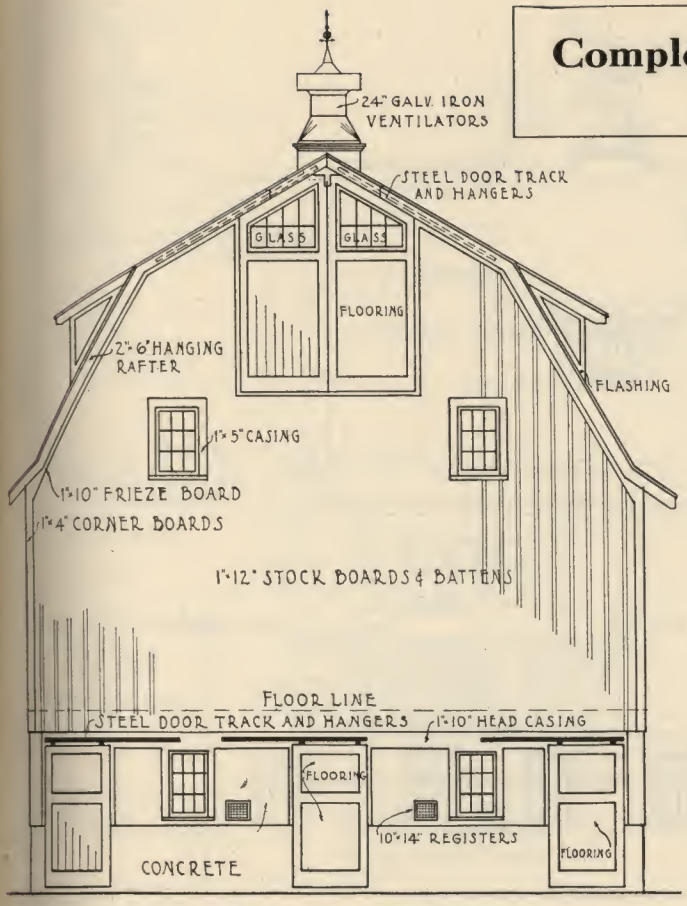
58 pieces 2x10 — 12.
29 pieces 2x10 — 14.

Material for One Truss.

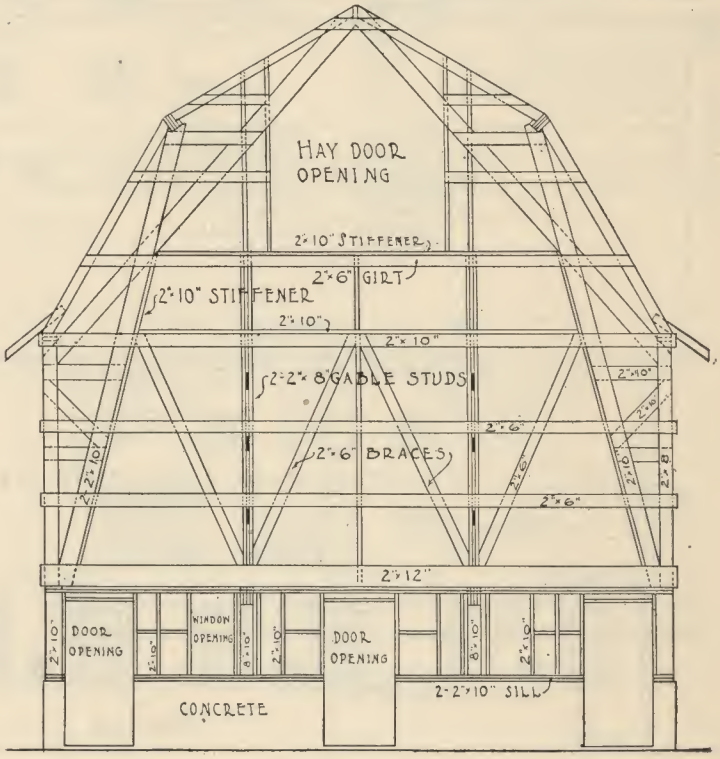
The list of material here given is for one truss. There are five of these and the quantities stated should be multiplied by five to secure the total for all trusses. This information is taken from the cross

Complete Plans for Modern Dairy Barn

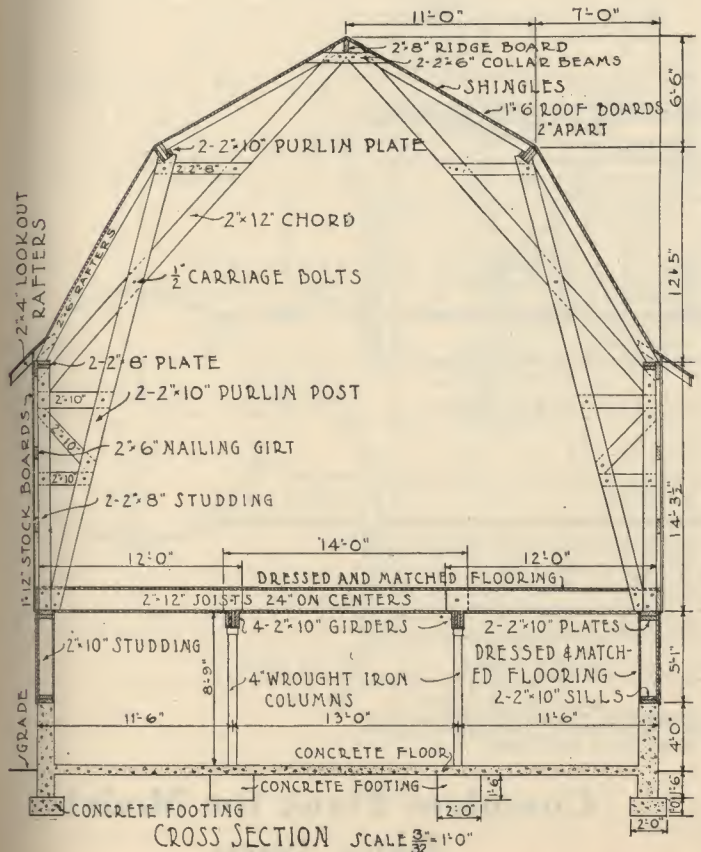
As Described in Detail on Pages 64 to 70



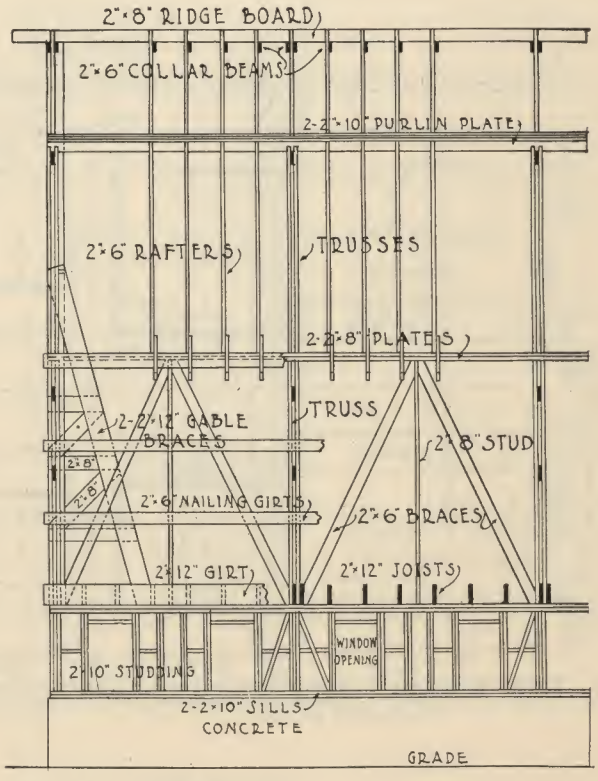
END ELEVATION SCALE $\frac{3}{32}$"=1'-0"



END FRAMING SCALE $\frac{3}{32}$"=1'-0"



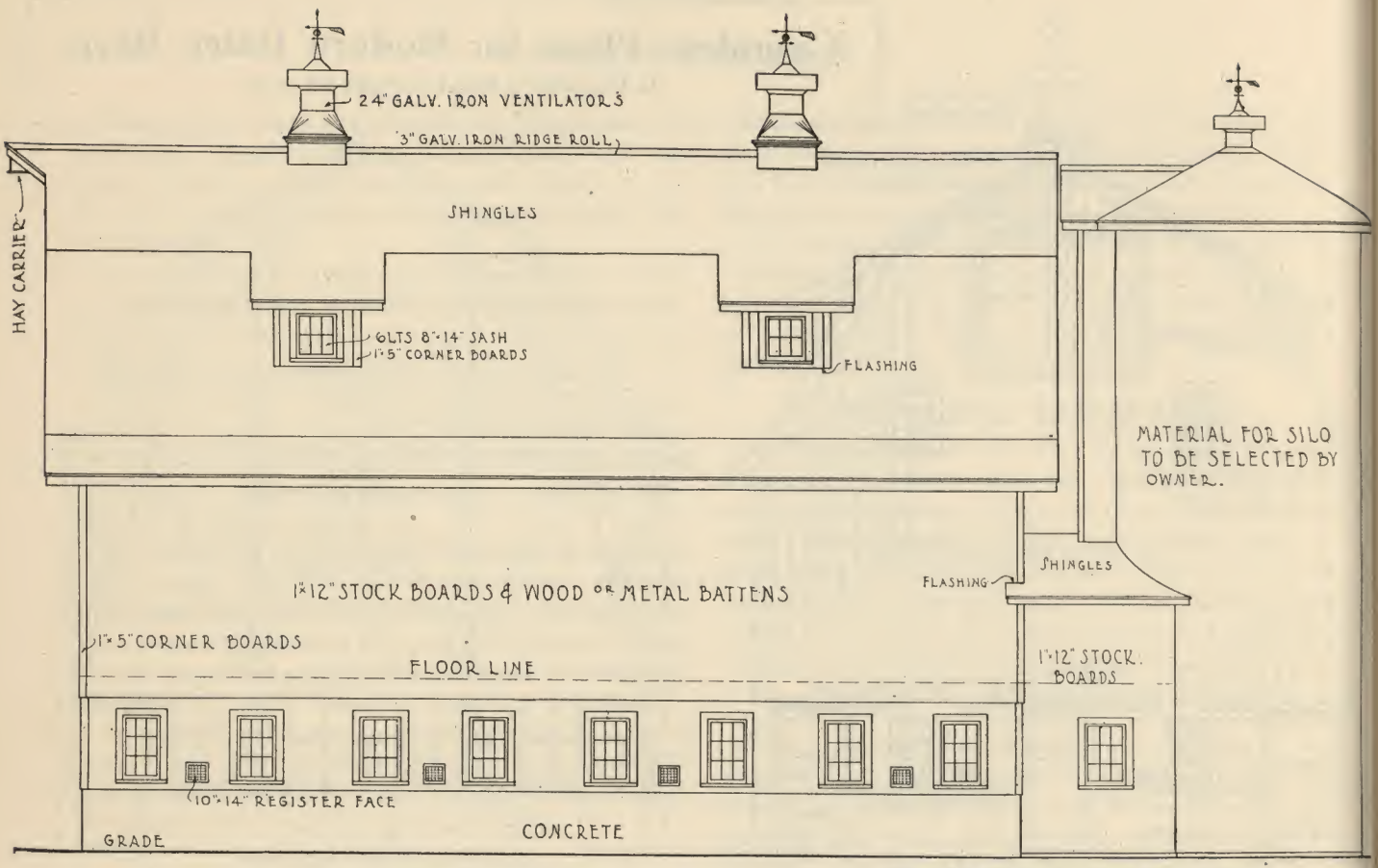
CROSS SECTION SCALE $\frac{3}{32}$"=1'-0"



SIDE FRAMING SCALE $\frac{3}{32}$"=1'-0"

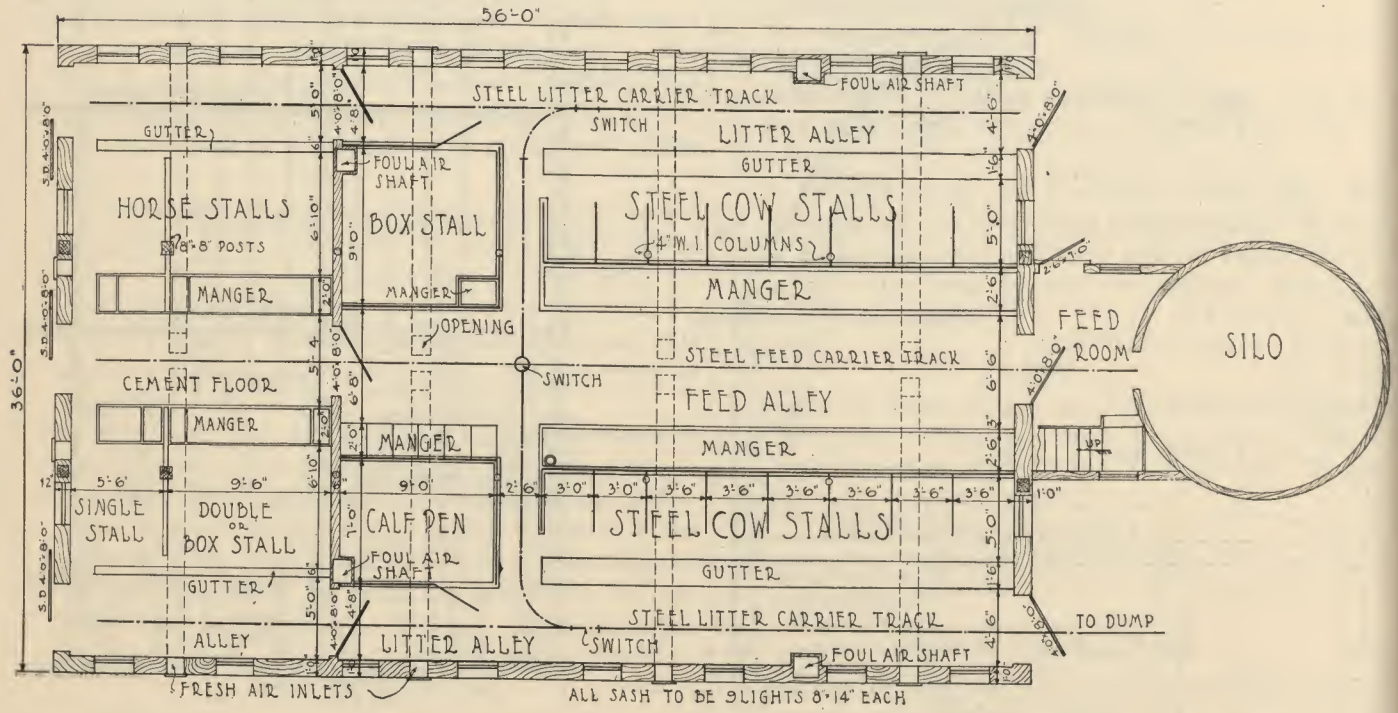
Complete Plans for Model Dairy Farms

as described in detail on pages 64 to 70



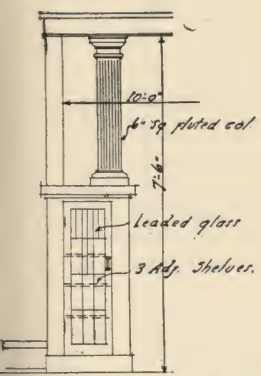
SIDE ELEVATION SCALE $\frac{3}{32}$"=1'-0"

Complete Plans for Model Dairy Barn
For Description and Bill of Material for this Barn See Chapter XVI, Page 64.

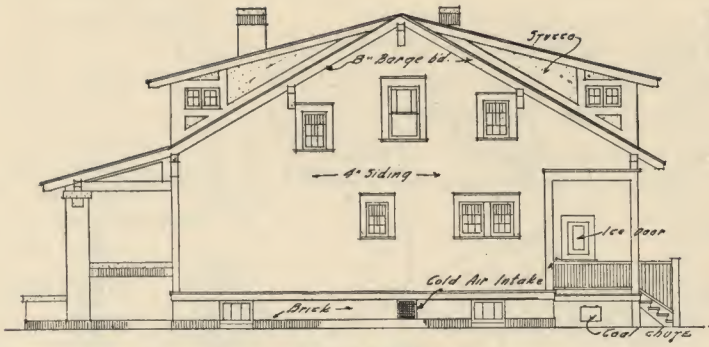


GROUND FLOOR PLAN
SCALE $\frac{3}{32}$"=1'-0"

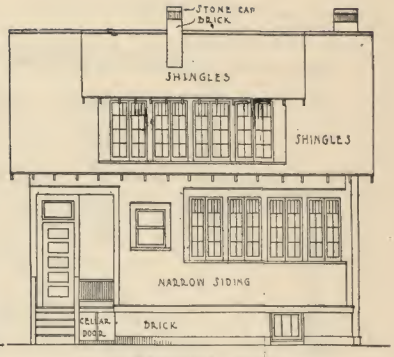
Complete Plans for Model Dairy Barn



1/4" SCALE COLONNADE OPENING DETAIL



WEST ELEVATION



REAR ELEVATION

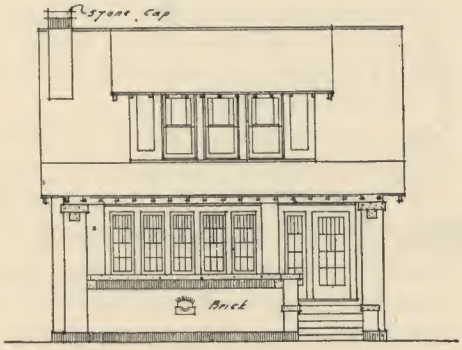
Working Drawings

of the

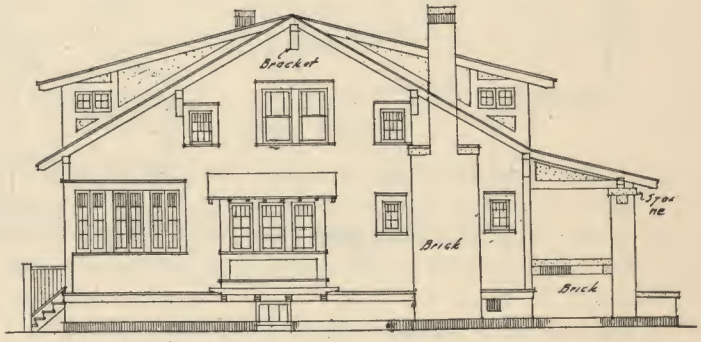
Home Builder Model Bungalow

Design No. 6605

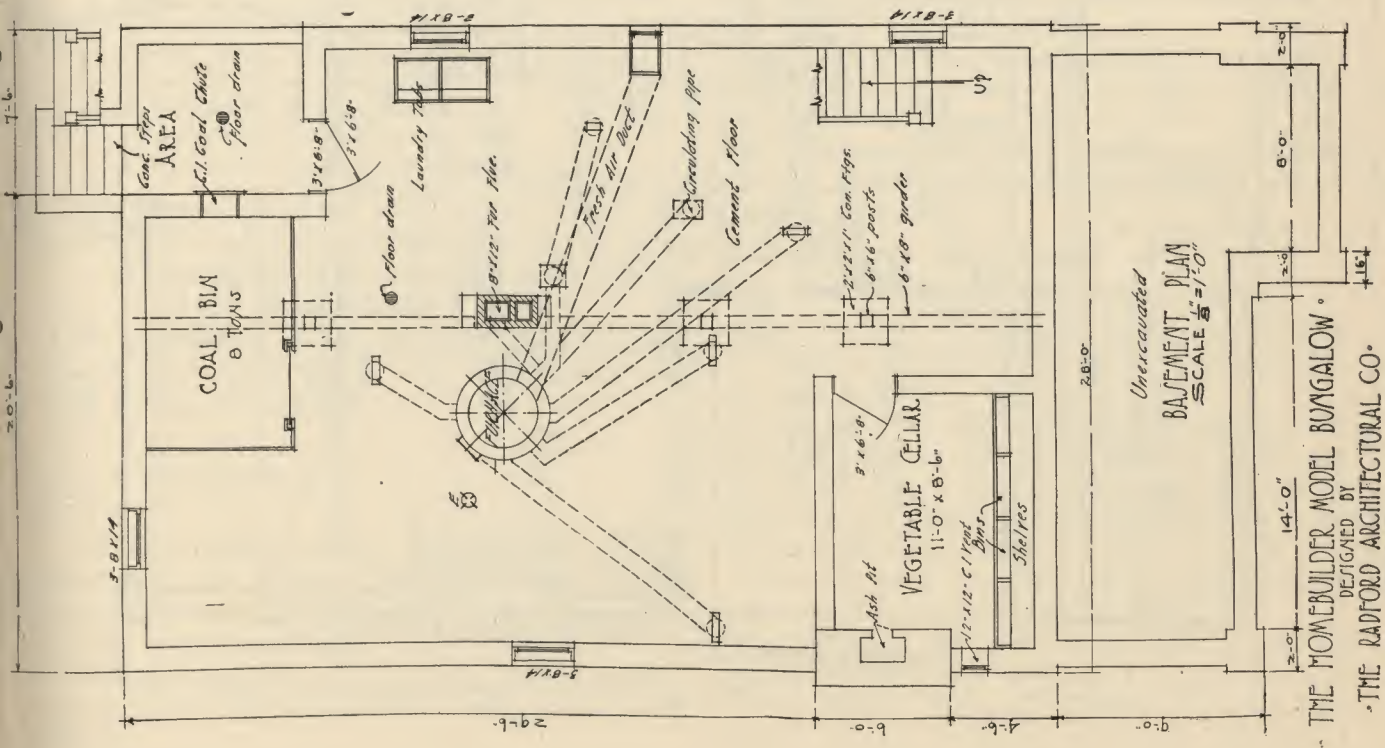
See Pages 185 to 190 for Specifications and Pages 56 to 60 for Complete Bill of Materials.

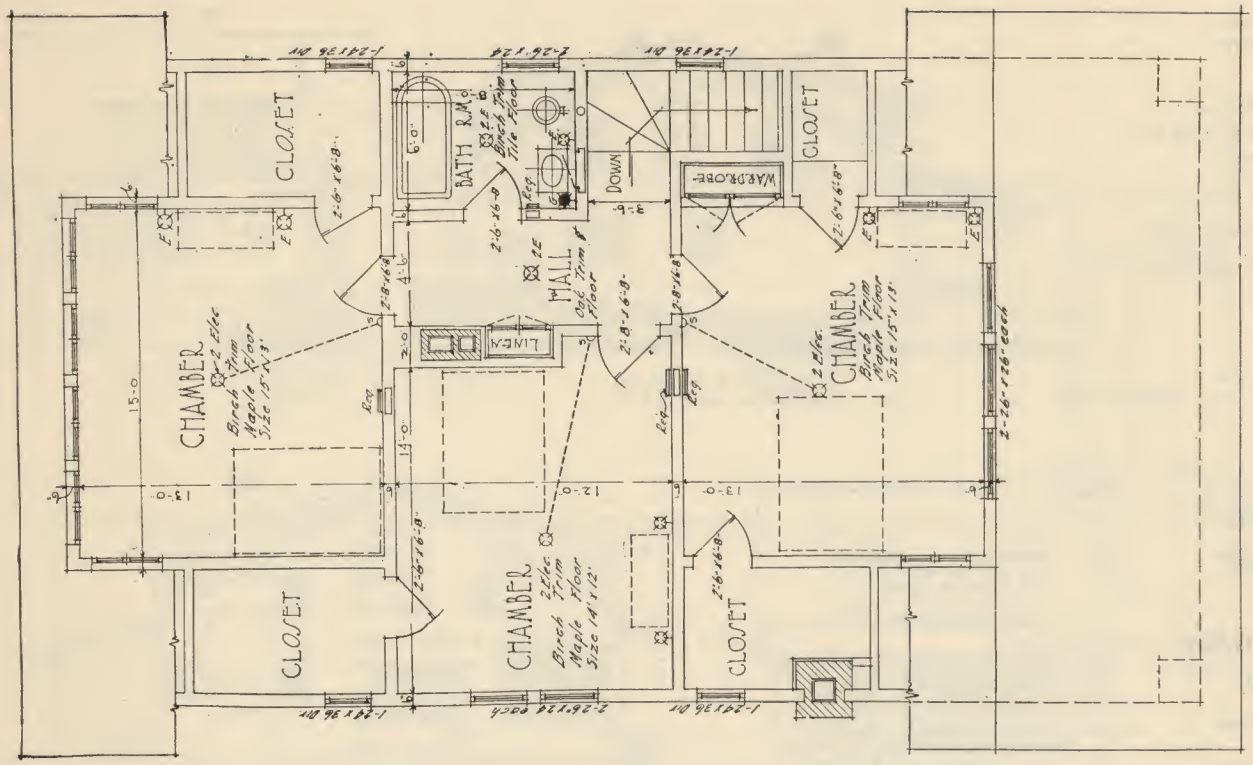


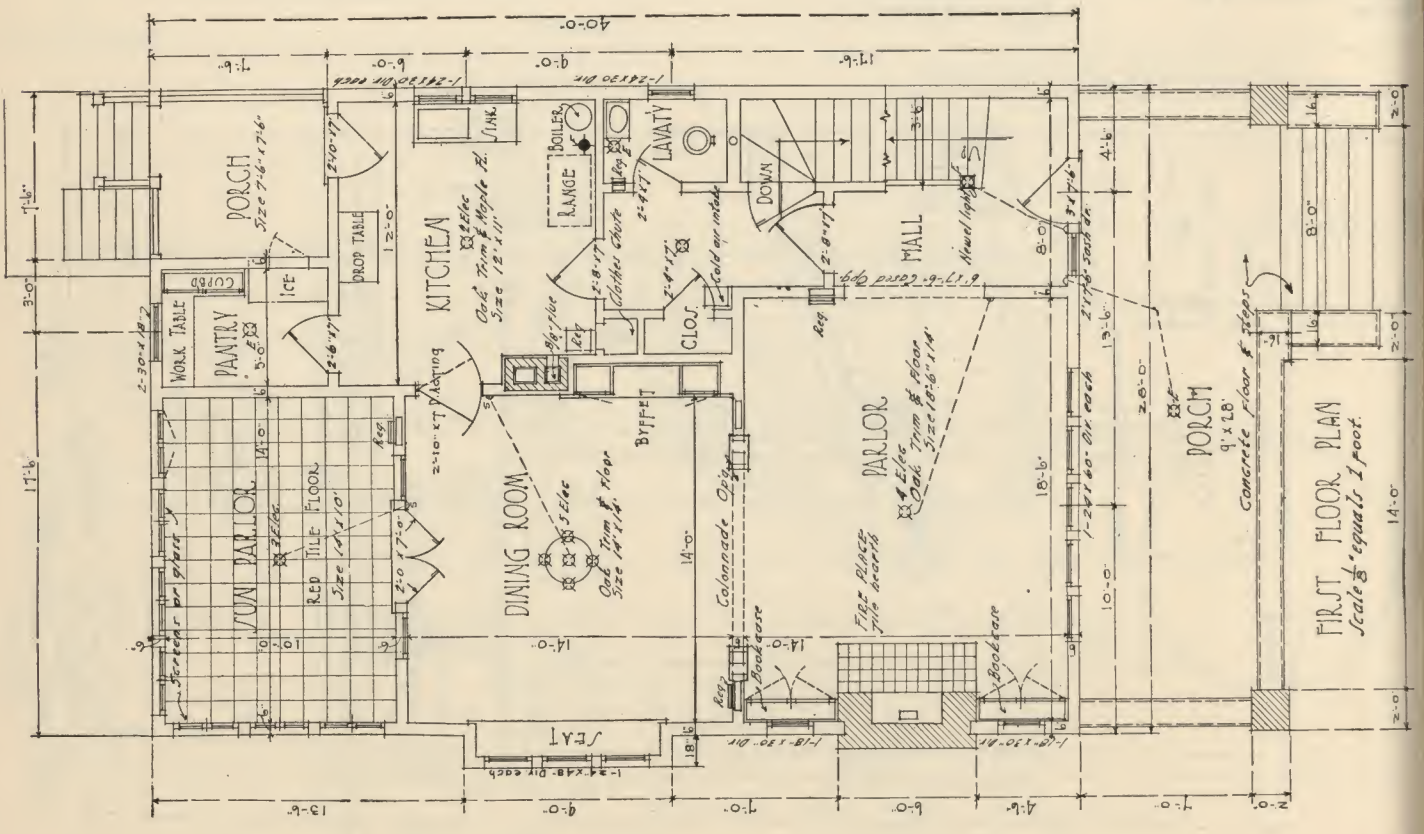
FRONT ELEVATION
Scale 1/16" equals 1' foot



EAST ELEVATION




CLOSET
BATH R.M.
MALL
CHAMBER
CLOSET
CHAMBER
CLOSET
CHAMBER
CLOSET
DOWN
LINEN
WARDROBE
SECOND FLOOR PLAN
CUBAGE ESTIMATE
23740 CUBIC FEET MAIN BUILDING
1208 " PORCHES (1/4 CUBAGE)
24948 TOTAL AT 15¢ A CUBIC FT
EQUALS $3757.20


PORCH
PANTRY
KITCHEN
RANGE
LAVATY
MALL
DOWN
SUN PARLOR
DINING ROOM
BUFFET
PARLOR
PORCH
SEAT
FIRST FLOOR PLAN
Scale 1/4 square foot

section and the several members of the truss may readily be located by reference thereto:

4 pieces 2x 8 — 14 studs.
4 pieces 2x10 — 28 purlin posts.
2 pieces 2x12 — 28 chords.
2 pieces 2x10 — 3′4″ cross braces.
2 pieces 2x10 — 5 angle braces.
2 pieces 2x10 — 4′8″ cross braces.
4 pieces 2x 8 — 5′8″ purlin-chord ties.
2 pieces 2x 6 — 5 collar beams.

Under Plates.

For the purlin plates 4 pieces 2 by 10, 56 feet long will be required. These should be made of 3 pieces 2 by 10 — 28 feet, and 2 pieces 2 by 10 — 14 feet for each purlin plate.

For the side plates 2 pieces 2 by 8, 58 feet long, will be required, which may be furnished in almost any length. The eave plates do not continue across the ends.

A ridge board, 2 by 8—62, is called for. This extra length being required for the protection of the roof over the ends.

End Framing.

Taking up that section of the drawing showing the end framing and doubling the quantity for one, gives the correct amount for both ends as shown here.

12 pieces 2x 6 — 14 nailing girts.
8 pieces 2x 6 — 16 end braces.
10 pieces 2x 8 — 18 gable studs.
4 pieces 2x10 — 20 end stiffeners.
2 pieces 2x10 — 24 end stiffeners.
6 pieces 2x10 — 12 nailing girts.
2 pieces 2x 6 — 32 nailing girts.
4 pieces 2x 8 — 12 gable studs.
4 pieces 2x 8 — 10 gable studs.
4 pieces 2x 6 — 8 gable nailing girts.
4 pieces 2x 6 — 5 gable nailing girts.

Four pieces 2 by 4—14 and 4 pieces 2 by 4—12 should be allowed to cut in between the nailing girts to receive the boxing where it is nailed to the rafters.

Side Framing.

The side framing section calls for eight pieces 2 by 12—20 for the gable braces. For the lateral braces the following are required:

2 pieces 2x8 — 5.
2 pieces 2x8 — 5′4″.
12 pieces 2x8 — 4.

The side framing section calls for one 2 by 8 studding in the center of each truss span, length 14 feet. As there are four spans on each side, eight of these must be provided.

From the truss to the stud two 2 by 6 braces, length 16 feet, are shown, which means 16 pieces of that size.

At the floor line is a 2 by 12, serving as a combination nailing girt and joist header. Eight of them will be required, also 24 pieces 2 by 6 — 14 for side nailing girts.

Rafters and Collar Beams.

Rafters are spaced 2 feet o.c. All rafters are 2 by 6 except the lookout rafters. There are two spans 14 feet long and two spans 12 feet long. Allowing one extra for the end rafter gives:

58 pieces 2x6 — 14 rafters.
58 pieces 2x6 — 12 rafters.
58 pieces 2x4 — 4 lookout rafters.
29 pieces 2x6 — 5 collar beams.

Sheathing for Roof.

Combining the several sections of roof on each side gives an area 29 by 60 feet, to be covered with roof boards and shingles. If 6-inch boards are used one-third may be allowed for the openings between the boards. The total area is 3,480 square feet. Deducting one-third leaves 2,320 feet of 1 by 6, 8 feet and longer.

Shingles, 35 M.

Barn Lining.

Now, going back to the cross section, it will be noted that the studding part of the walls of the stable floor is to be lined with flooring. It should be noted, also, that the lining is shown to be continued over the ceiling.

Deducting 12 inches for the outside walls and one foot for the two center girders leaves the space to be covered 34 by 53 feet, or 1,802 square feet. The side walls are 176 feet long by 5 feet 4 inches high, a total of 939 square feet. Windows and doors will fully make up the loss in matching, so this gives a total of 2,741 feet of flooring.

While figuring the flooring needed, it should be remembered that the entire hay floor is to be floored. The space to be covered is 36 by 56, in this case, total 2,016 square feet, with one-fourth added, gives 2,520 feet of flooring. This makes a grand total of 5,261 feet of flooring.

Barn Boards.

For the first studded section barn boards 5′ 4″ long are required. The distance around the building is 184 feet, multiplied by five and a third, gives 981 feet, board measure.

From that total deduct the space occupied by 20 windows, 3 feet by 4 feet, 240 square feet, and six doors 4′ by 5′ 4″, a total of 128 square feet. Total deductions 368 square feet, leaving 613 feet to be covered with barn boards.

There will be a call, also, for 613 linear feet of battens, wood or metal, for this section.

For the sides 112 pieces 1 by 12 — 16 will be needed. For the ends 20 pieces 1 by 12 — 20, for the two sections under the hay mow doors, and 90 pieces 1 by 12 — 16 for the gables and other parts of the end siding. No allowance is made for the end windows.

Also, 202 battens 16 feet long, 20 battens 20 feet long.

Additional windows may here be noted. Four sash and frames, 9 light 8 by 14, and four frames 6 light, 8 by 14 (dormers) are required.

The Four Dormers.

It is not necessary to cut into the rafters to frame the dormers. The quantities here specified are for material for all the dormers, the several parts being designated.

24 pieces 2x4 — 3 studding.
12 pieces 2x4 — 4 rafters.
8 pieces 2x4 — 6 nailing girts.
8 pieces 1x5 — 3 corner boards.
8 pieces 1x4 — 3 corner boards.
64 feet sheathing.
1,000 shingles.

Cornice.

For the cornice the following is required:

4 pieces 1x 3 — 16 corner boards.
4 pieces 1x 4 — 16 corner boards.
4 pieces 1x10 — 16 frieze boards.
4 pieces 1x 8 — 12 frieze boards.
4 pieces 2x 6 — 14 hanging rafters.
4 pieces 2x 6 — 12 hanging rafters.
4 pieces 2x 6 — 4 hanging rafters.
8 pieces 2x 6 — 6 hanging rafters, dormas.

Feed Room.

The plans are not absolutely complete, but the materials here listed should be ample to build the feed room, as indicated.

16 pieces 2x4 — 14 studding.
8 pieces 2x4 — 9 plates.
288 feet barn boards.
288 linear feet battens.
2 sash, 9 light, 8x14.
2 sash frames.
2 pieces 1x6 facia, 12 feet long.
8 pieces 2x4 — 9 rafters.
2 pieces 2x4 — 6 rafters.
2 pieces 1x4 — 10 to bend against silo.
120 feet sheathing.
2,000 shingles.

Silo.

Silos usually are furnished complete in standard sizes, all material except that for the foundation being included. There is no estimating required for that part of the structure.

Other Equipment.

For the sliding doors three sets of hangers and 24 feet of track will be needed, in three sections.

Four special sash must be furnished for the gables, also two batten doors for gables.

Two 24-inch galvanized iron ventilators and 56 feet of galvanized iron 3-inch ridge roll.

NOTE.—In making an estimate it might be found easier, in assembling the bill in final shape, to take off all doors, windows, etc., at one time.

Barn Equipment.

There is a great deal of material and fittings called for in fitting up the first floor.

Mangers, if of concrete, should be figured when the material for the foundation is determined.

If the reader will examine the ground floor plan he will find eight 4-inch steel posts are indicated; fourteen steel cow stalls.

Four wood posts, size not given.

An elaborate system of feed and litter carrier track is shown.

Three inside doors serve to isolate the horse and the cow sections of the barn.

There are eight fresh air inlets and four vents leading to the foul air shafts. Two of these are built into the walls and two in the box stalls.

A partition runs through the building, and in addition there are box stalls, calf pen, double and single stalls for horses.

The system of ventilation is important. Fresh air is brought to the center of the barn and liberated. The foul air shafts take up the used air and carry it to the ventilators, on top of the barn, where it is discharged.

Both must be virtually air tight or they will not serve their purpose.

No details are given for the interior work, but a very definite list of material could be made up by arbitrarily supplying them. Before doing so, however, it would be well to consult the owner.

CHAPTER XVII.

BILLS OF MATERIAL FOR FARM BUILDINGS

Plans or ideas for a structure are not always complete. Dimensions may be given concisely or approximately. Interior fittings may be largely a matter of guesswork. Specification may not be furnished or available.

In some cases the dealer or the contractor may be supplied with a perspective and floor plan and be asked to tell what the material or the building complete would cost.

Diplomacy, which is the parlor name for common sense, should be employed in handling the situation. It should be explained that ideas respecting construction and equipment differ and that such factors regulate cost.

Stating the case in another way it should be bourne in mind and impressed on the customer that without definite plans and specification a definite statement of cost cannot be given. A forewarning of this character is a protection both to the dealer and to his customer. It puts the customer on his guard and tends to eliminate uncertainties.

To illustrate this point: If there are no specifications quantities may be correctly estimated, but the dealer may figure on the very cheapest or the most expensive material suitable for the purpose.

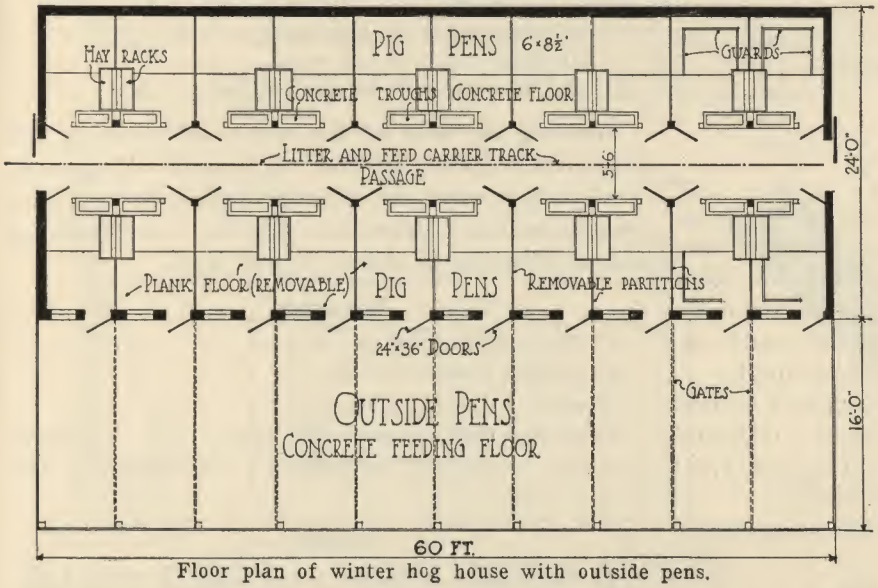
So in every case the quantity and the grade should be specified and in so far as possible the brand or kind of lumber or other material should be given in the estimate. Otherwise there is liable to be misunderstanding and dissatisfaction.

Figuring Material for a Hoghouse.

The amount of work required in taking off a bill of materials cannot always be judged by the size or importance of the structure.

Hoghouse Design No. A298 furnishes an example in point. This is a combination concrete and frame structure. The information here supplied is identical with that furnished in an issue of the American Builder, and is as nearly complete, possibly much more so, as will be furnished the dealer or contractor in many cases.

It should be bourne in mind that neither specification or elevations are given. Again the importance of specifying qualities as well as quantities is urged in preparing a bill of materials.



Floor plan of winter hog house with outside pens.

Foundation.—Footings for the foundation at 18″ wide by 1′ deep. The foundation wall is 1′ wide. The easiest way, therefore, is to turn the footing on edge and add its width to the height of the foundation wall. The height of the foundation wall, as shown on the cross section, is 2′ 6″, with footing added, 1′ 6″, gives a total of 4′.

Distance around the structure is 168′, multiplied by 4 feet, makes the cubical footage 772.

Wall.—Cross section is a bit unreliable, in that the character of the left hand wall is not disclosed.

Winter hog house design of the approved saw-tooth roof style. Face this hog house toward the south and the upper windows let the warm sunlight into the far pens. This design calls for a building 24 feet wide and can be made any length, depending on number of pigs to be wintered. Floor plan shows building 60 feet long. We can furnish complete set of blue printed working plans and typewritten specifications for only $6.00 per set. When ordering ask for design No. A289.

The rear wall is 60 feet long by 5 feet high, 8″ thick. Cubical contents 200 cubic feet.

End walls are 24 feet long by 6 feet high, taking out for the door, and 8″ thick. Contents, 192 cubic feet.

Floor, 60 by 24, and feed floor 16 by 60, makes a total of 40 by 60 or 2,400 square feet, by say 4 inches thick. This gives 800 cubic feet. Total concrete:

	Cu. ft.
Foundation and footing	772
Walls	392
Floors	800
Total	1,964
Add ¼ for difference between dry and mixed volume, gives	491
Grand total	2,455

Next the character of the mixture must be taken into account. On a one-two-three mixture the cement comprises one-sixth of the total, and one-sixth equals the number of bags of cement required. On a one-three-five mixture the cement equals—in bags—one-eighth of the total quantity required.

The kind of mixture must be ascertained before quantities can be accurately determined. It should be remembered that sand and gravel are cheaper than cement.

Figuring on a one-two-three mixture the process is given:

2455 cubic feet, 1/6 cement, equals 609 bags.
Sand, two, equals 1,218 cubic feet.
Gravel, three, equals 1,827 cubic feet.

Divide the sand and gravel by 27 to ascertain the number of cubic yards.

If floors in hoghouse and feeding pen are to have wearing surface, use this formula:

One part Portland Cement to two parts coarse sand. Wearing coat would be ¾ inches thick.

Sills and Plates.

If south or pen-side wall is to be frame, sills and plates should be made of 2 by 6; if it is a concrete wall, 2 by 8 will be required. Two sections 60 feet long will be needed if frame, one section if concrete.

A 2 by 8 ribbon is wanted to receive the rafters of the low part. This is 60 feet long. Two plates made of 4 by 6 are called for to support the rafters of the higher portion of the building, and two pieces 2 by 8 for the plate on the concrete wall. Figuring frame south wall, which will prove the more satisfactory method of construction, you have:

4 pieces 2x6 — 60 feet.
1 piece 2x8 — 60 feet.
2 pieces 4x6 — 60 feet.
2 pieces 2x8 — 60 feet.

Lengths may be selected or specified later. 20-foot lengths will work without waste, or three sixteens and a twelve.

Studs and Posts.

The floor plans show the location of eighteen posts or uprights. These are 4 by 4, spaced 6 feet apart. Half of these are 9′ 6″ and half 12′. Therefore:

9 pieces 4x4 — 10 uprights.
9 pieces 4x4 — 12 uprights.
20 pieces 2x4 — 5 studs in sawtooth.

Rafters are spaced two feet on center, giving:

31 pieces 2x4 — 10 short span.
31 pieces 2x4 — 20 long span.
31 pieces 2x6 — 12 for ties or joist.

Figuring the area of the roofs and allowing for projections, gives 1,738 feet of boards. If flooring or shiplap is used, the quantity should be increased proportionately. Allow say 150 feet for sheathing around windows in sawtooth stud wall.

Windows.

20 sash, 6 light, 10 by 12.
20 frames for stud wall.
20 sash, 6 light, 10 by 12.
20 frames for concrete (or stud) wall. Question this item until you ascertain of what material the wall is to be made.

Doors.

20 inside gates or doors, 2 feet wide by 4 feet high, made of

1 piece 2x12 — 2.
4 pieces 2x 6 — 2.
2 pieces 2x 4 — 4.

Ten outside batten doors, 24″ by 36″.

These doors may be made of 2 pieces 1 by 4 — 2, 8 feet D & M stock.

Two doors, 3 by 7 feet. Two door frames for same for concrete walls.

Cornice.

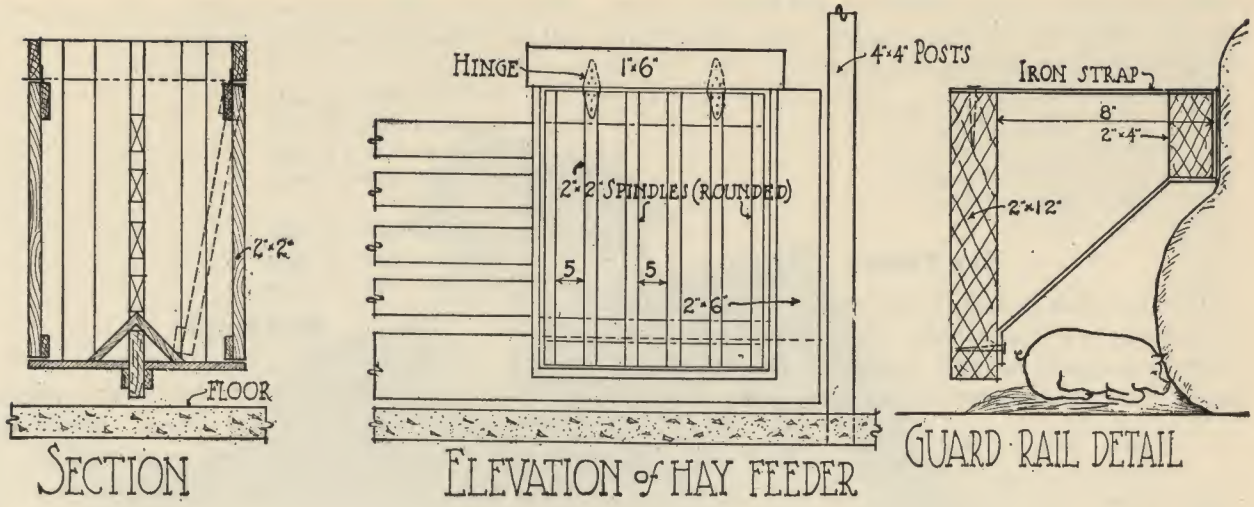
Details are not given, but the perspective shows the roof boards are not covered, that the cornice consists of a fascia. There are three lengths of 60 feet, two of 10 feet and two of 20 feet, making a total of 240 feet, or

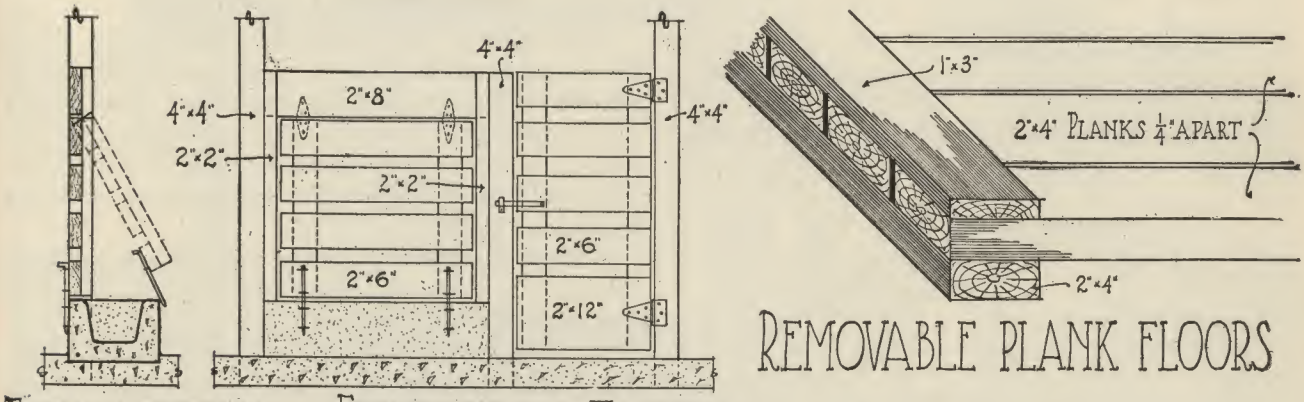
15 pieces 1x4 — 16.

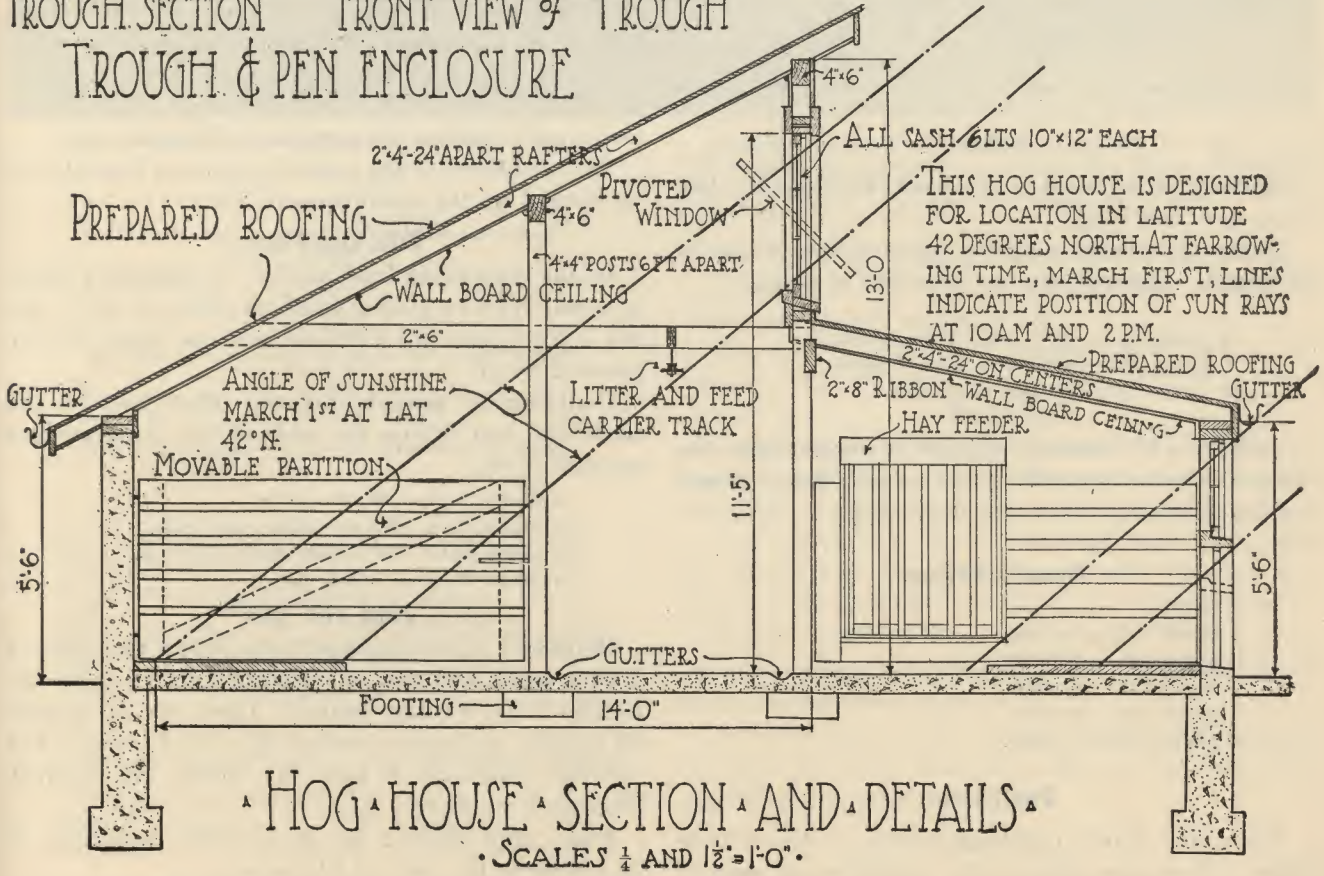
It will have been noted that the method here used has been to determine the number of pieces of the lengths for each separate piece of the work. This permits of furnishing stock in lengths that may be used without waste.

Moveable Partitions.

While the details given are not absolutely specific they have been interpreted to call for sixteen mov-







Working Details Drawn to Exact Scale of Winter Hog House, Design No. A289, Illustrated on Page 67.

able partitions, one-half of which are broken in part to give place for the hay racks. The bill of materials for one partition is given:

1 piece 2x12 — 8 rail.
3 pieces 2x 6 — 8 rail.
2 pieces 2x 6 — 4 uprights.
1 piece 2x 6 — 8 brace.

Hay Feeders.

This is rather a difficult estimate to make because everything is not specified. Consulting side and end views the dealer or the contractor will be able to locate the various parts of the hay racks.

1 piece 1x10 — 4 shed.
2 pieces 2x 2 — 4 cleats.
1 piece 1x12 — 4 bottom.
2 pieces 1x 6 — 4 hinge boards.
4 pieces 2x 2 — 4 uprights.
4 pieces 1x 4 — 4 cross cleats.
6 pieces 2x 2 — 4 spindles.
2 pieces 1x 4 — 4 ends.

The above material will make one feeder. Twenty are shown on the floor plan.

Trough Gates—Each.

2 pieces 2x2 — 5 uprights.
1 piece 2x8 — 3 cross bar.
4 pieces 2x6 — 2'9" rails.
2 pieces 2x6 — 2'6" battens.

Guard Rails—Each.

2 pieces 2x 4 — 3'10".
1 piece 2x12 — 4' 8".
Strap and angle irons.

Floor.

Space to be covered in each pen, 4' 6" by 6'. Use 2 by 4, 6 feet long.

There are twenty pens for which floors are to be provided. Material for one pen floor is given:

2 pieces 4x4 — 4'6" cross strips, above.
2 pieces 1x3 — 4'6" cross strips, below.
18 pieces 2x4 — 6' floor material.

(NOTE.—If wearing surface is figured for the floor, the space covered by the wooden floors should be deducted from the total floor area.)

Outside Fences.

8 posts.
4 pieces 2x8 — 16 rails.
6 pieces 2x6 — 16 rails.
6 pieces 2x8 — 20 rails.
8 pieces 2x6 — 20 rails.
2 pieces 2x6 — 10 rails.

Partitions.

Gates are shown in the partitions in the outside pens. There are nine of the partitions, in each of which two posts will be needed. The quantity for all of the partitions is here given:

18 posts.
18 pieces 2x8 — 6 rails.
18 pieces 2x8 — 8 rails.
27 pieces 2x6 — 6 rails.
27 pieces 2x6 — 6 rails.

Gates—

18 pieces 2x8 — 2 rails.
37 pieces 2x6 — 2 rails.
18 pieces 2x6 — 4 cleats.

Roof Board.

All rafters are to be lined on under side with roof board, or wall board. Dimensions should be taken inside the walls and plates. The length is 58' 4", the width of the long span 15 feet, of the short span 8 feet, so 23 times 58 1/3 feet, or 1,340, is the quantity required.

ESTIMATING A CORN CRIB.

Floor plan of this corn crib, Design A356, shows the size to be 40 by 26 feet. The cross section shows two and infers four foundation walls. Total length of all walls is 4 times 40, 160, plus 52 feet, or 212 feet. To be absolutely accurate, 8 feet of foundation wall could be deducted, that length being occupied by the end walls.

Adding the footing to the wall height gives a total of 5 feet of a thickness of 1 foot. This gives a total of 1,060 cubic feet.

This figures the foundation to the bottom of the floor. The total area covered by the building is 40 by 26, or 1,040 square feet of floor, 4 inches thick; this is the equivalent of 343 cubic feet, or a grand total of 1,403 cubic feet of concrete. If one-fourth be added to take care of the difference between dry and mixed volume, the result is 1,754 cubic feet.

The quantities of the several materials then should be figured by the mixture to be used.

Sills and Plates.

In the uncovered half section of the detail there is a call for two plates made of 2 pec. 2 by 6, one sill 2 by 6, one sill 2 by 10 and one plate of two pieces 2 by 10.

Doubling to provide for the other half of the structure, and taking the ends of the building into account gives:

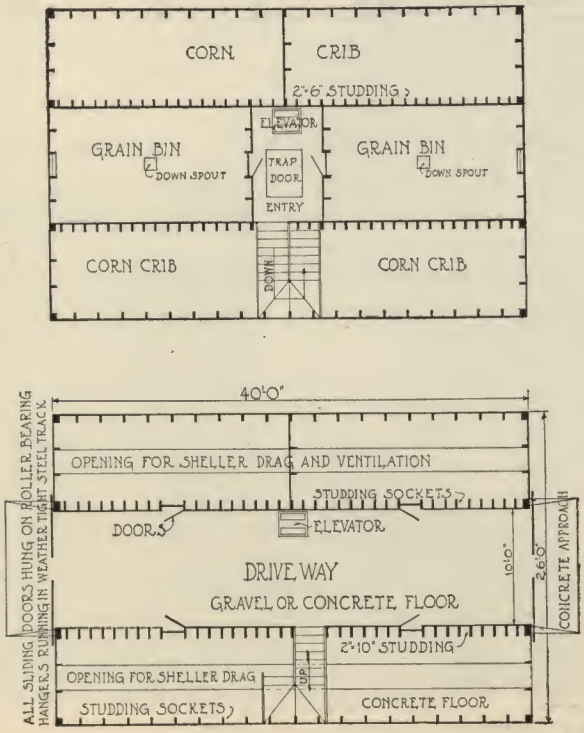
4 pieces 2x 6 — 26 end plates.
20 pieces 2x 6 — 20 side plates and sills.
12 pieces 2x10 — 20 inside plates and sills.
4 pieces 2x 6 — 8 end plates.

Joist and Ties.

Reference to the cross sections shows five tiers of 2 by 6 joists and ties, one section 3 by 14 joist, one section 1 by 6 collar beams. These are all spaced 24 inches on center, except the 3x14 joist. The outside spans are 8 feet, the inside are 12 feet. Therefore we have:

Four tiers joist, 2 by 6 — 8 feet, consisting of 21 pieces to the tier, or 84 pieces.

Photographic Architectural View of Modern Two-Story Corn Crib and Granary Designed for Average Size Farm. This Building is Equipped with Inside Cup Elevator for Putting in Grain, and Drag Line for Taking it out. Design No. A356.



Ground Floor Plan and Second Floor Plan of Modern Corn Crib and Granary, Size on the Ground 26 by 40 Feet.

One tier 2 by 6 ties, 12 feet long, or 21 pieces.

One tier, 3 by 14 joist, 14 feet long, spaced 12 inches on center, or 41 pieces.

One tier 1 by 6 collar beams, 6 feet long, or 21 pieces.

Studding.

Outside and end studding are spaced 24 inches on centers. Allowing for doubling at corners calls for 66 pieces 2 by 6, 18 feet long, for sides and ends.

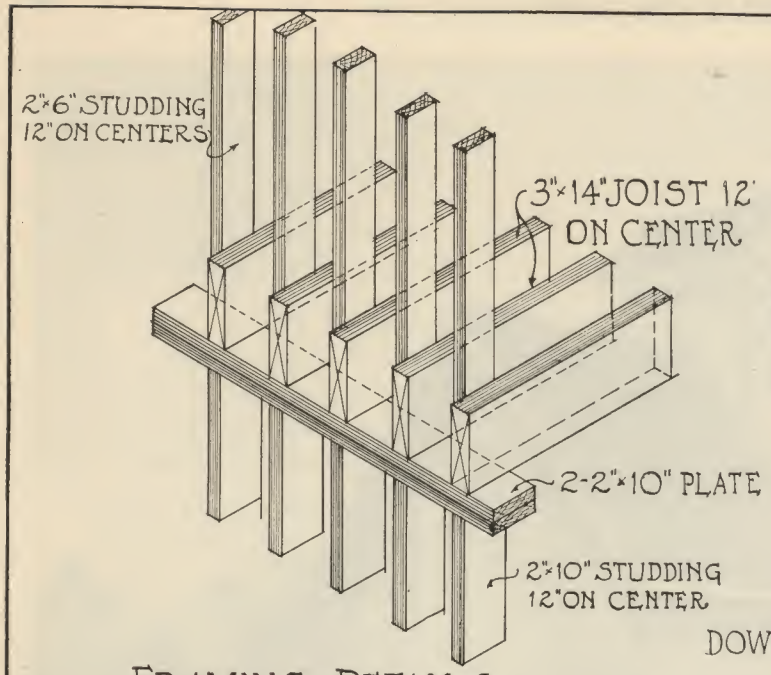
Ten pieces 2 by 6, 7 feet long, will be needed for the space over the doors at the ends, or five pieces 2 by 6 — 14.

Inside wall studding are spaced 12 inches on center, calling for 41 pieces for each tier, or 82 pieces for the two walls.

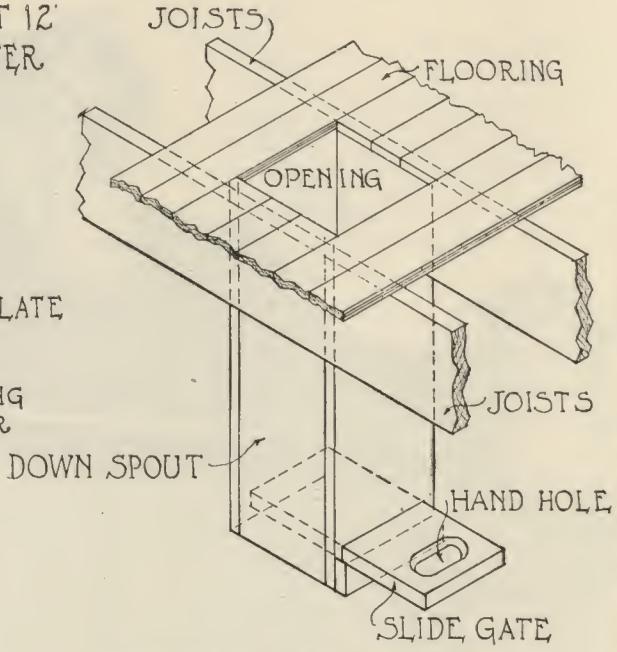
An allowance of 200 linear feet of 2 by 4 should be made for gable studding above the plates and for doubling around the windows.

Rafters.

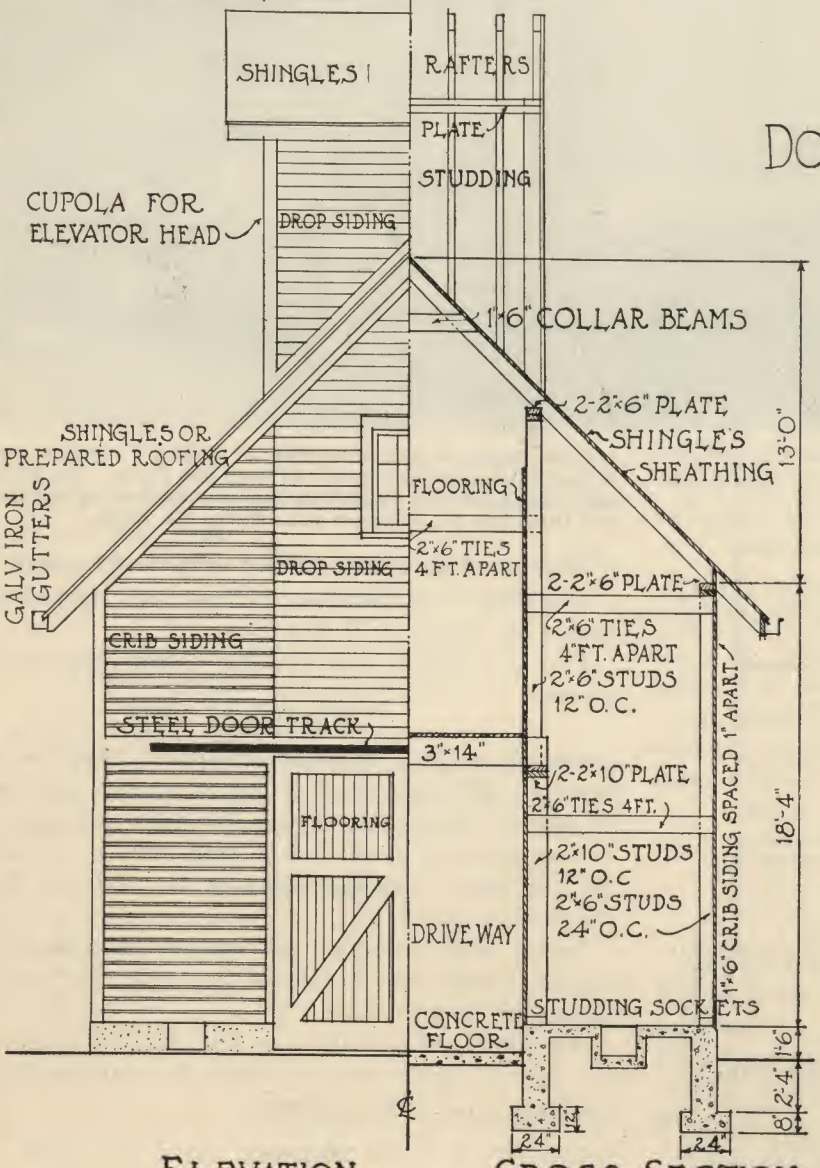
The exact size of the cupola cannot be readily determined. This superstructure will cut into



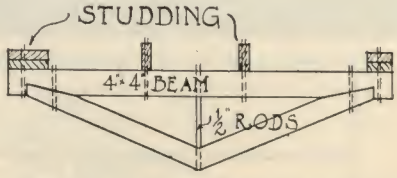
FRAMING DETAILS



DOWN SPOUT DETAIL



ELEVATION CROSS SECTION



MAKE 2 FOR EACH CRIB END

DETAIL OF END BRACES

SHEET OF CRIB DETAILS

SCALE ⅛" - ¼" = 1'-0"

Details of Construction of Modern Two-Story Corn Crib and Granary, Design No. A356, as Illustrated on Page 71. Note Extra Heavy Frame Work Required to Hold Up the Huge Concentrated Weight of Grain When Filled.

rafters. Figuring the roof straight, would call for 42 pieces 2 by 6, 22 feet long, for the rafters. Assuming that the cupola is 10 feet wide and sits in the center of the building, as shown in the perspective, that would place it fifteen feet from either end and call for an extra rafter to go alongside and aid in making the structure stable.

Figuring it on that basis would give eighteen sets of rafters, or

36 pieces 2x6 — 22.

For the rafters stopping at the cupola a fourteen-foot length would be required. Of these there are four sets, or

8 pieces 2x6 — 14 feet.

Cupola Framing.

Framing the cupola without adequate details calls for considerable guesswork. Here is one guess:

Plates, 4 pieces 2x6 — 8.
4 pieces 2x6 — 10.
Studs, 24 pieces 2x6 — 12.
Rafters, 12 pieces 2x6 — 8.

Sheathing Roof.

Allow for covering an area 44 by 44 feet, or 1,936 square feet. If shingles are used, deduct one-third, 645 feet, which leaves 1,291 feet, board measure.

If patent roofing is used, figure on covering, solid, the entire roof area.

Shingles and Patent Roofing.

About nineteen thousand shingles or nineteen squares of patent roofing will be required to cover the roof.

Crib and Drop Siding.

Surface measure for the crib siding is 40 plus 40, for the sides, plus four 8-foot sections on the ends, total 112 feet by 18 feet. This gives 2,016 square feet to be covered. Deduct one-third for openings, gives 672 feet, leaving 1,344 feet to be supplied.

Drop siding must be furnished for the two gables and the cupola.

The gables are 12 feet wide by an average height of 17 feet, which gives 408 square feet.

Figure the average height around the cupola at six feet, to allow for waste, and the size, as 8 by 10, gives 216 square feet, a total of 624 square feet to be covered. Add one-fourth for waste, gives 780 feet.

Flooring.

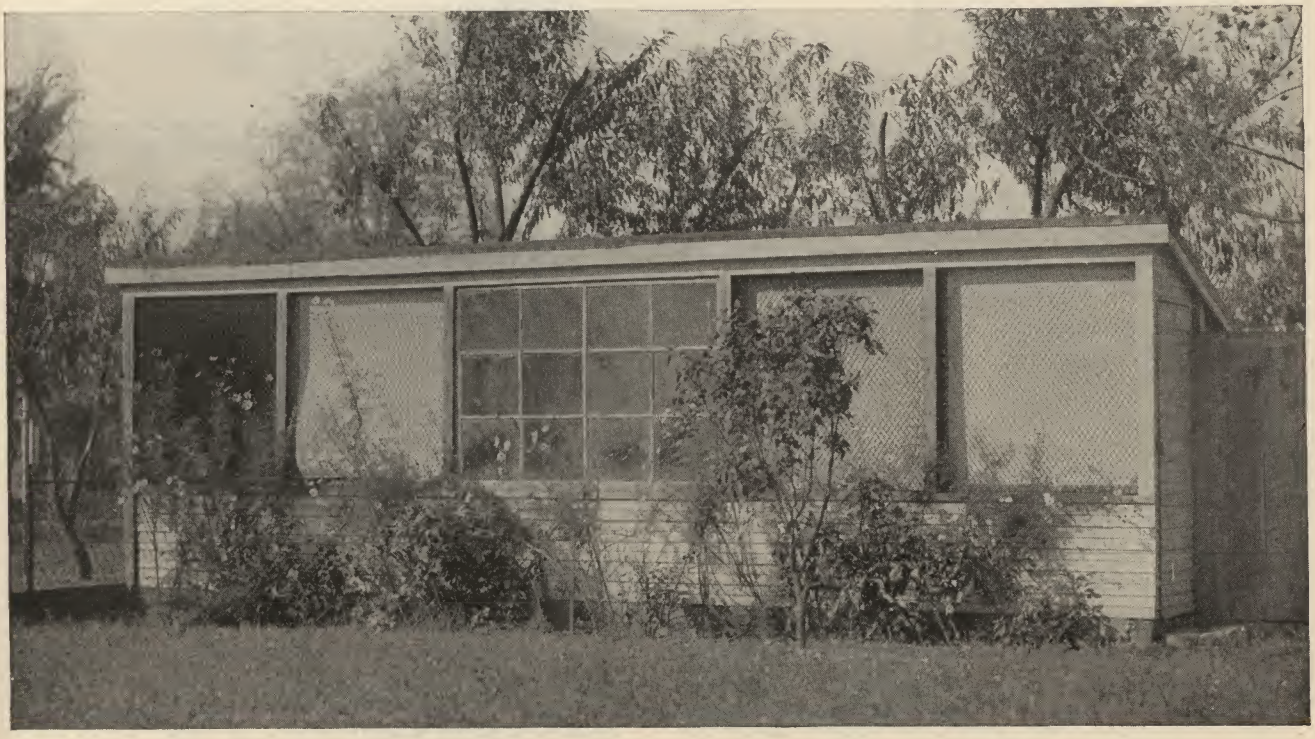
The space over the driveway, 12 by 40 feet, is to be covered with flooring. The outside of the partitions also is to be covered with flooring. This gives two sections 23 feet high and one section 12 feet wide, total area 58 by 40 feet, or 2,320 square feet. With one-fourth added to cover waste, the amount of flooring needed is 2,900 feet.

Doors and Windows.

Two sets sliding doors, with frames.
Four inside doors with frames
Four windows with frames. (Size not given.)

Stairway.

14 risers, 3 feet long.
13 treads, 3 feet long.
2 pieces 2x10 — 14 horses.
1 piece 2x12 — 14 horses.



Modern open front poultry house with curtains for admitting plenty of fresh air.

Farm Poultry House Containing Two Rooms. Size on the ground 20 by 14 ft. We can furnish complete set of blueprinted working plans and typewritten specifications for only $3.00 per set. When ordering, ask for Design No. A338.

Shell Drag Top.

80 lineal feet 4" stock, for cleats.
160 feet boards, 2 feet long.

Downspouts.

4 pieces 1x10 — 10.
4 pieces 1x12 — 10.
8 pieces ¼ rod, 10 feet.

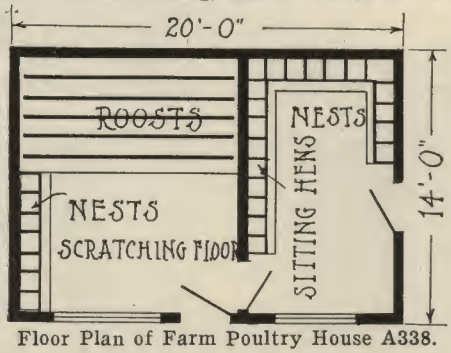
A cup elevator to be operated by gas engine or horse power is specified, but no information regarding it is given.

The manufacturers' catalog should be consulted for details of such equipment and their requirements in a structural way before the building is begun.

ESTIMATING A POULTRY HOUSE.

This is somewhat simple, but perhaps not so much so as it might, at first glance, appear.

Foundation and floor should be figured as in the other examples cited.



Floor Plan of Farm Poultry House A338.

Sills and Plates.

All sills and plates are 2 by 4.

6 pieces 2x4 — 20 for sides.
2 pieces 2x4 — 14 for ends.
11 pieces 1x6 — 6 for collar beams.

Studding.

Studding are a trifle difficult. A close examination of floor plan and cross section, taking into account

the perspective, shows the following are needed.

11 pieces 2x4 — 3'6" front wall.
11 pieces 2x4 — 5' rear wall.

End walls—
4 pieces 2x4 — 6.
4 pieces 2x4 — 7.
2 pieces 2x4 — 8.

Rafters—
11 pieces 2x4 — 12.
11 pieces 2x4 — 8.

Sheathing—
The roof requires 462 feet of sheathing, if prepared roofing is used, or 347 feet if shingles are used.
To sheath the inside walls calls for 488 feet of matched stock.
Wall board for ceilings, 290 feet. This should be furnished in the proper lengths.

Siding.

The rear wall is solid, 4x20 feet, giving	80 feet
Ends give 98 sq. ft. each	196 feet
Front wall, 6x20	120 feet
Total	396 feet
There are two windows 5x6 ft., and two doors, 4x7 ft., total	116 feet
Balance	280 feet
Add one-fourth	70 feet
Makes the total siding required	350 feet

This plan calls for two windows, with frames and two outside and one inside doors, with frames for the former. Sizes are not specified, but should be stated in the estimate.

Shingles or Roofing.

If shingles are used, figure on five thousand, or five squares of prepared roofing.

Cornice and Corner Boards.

44 linear feet 1x6 eve facia.
42 linear feet 1x4 gable facia.

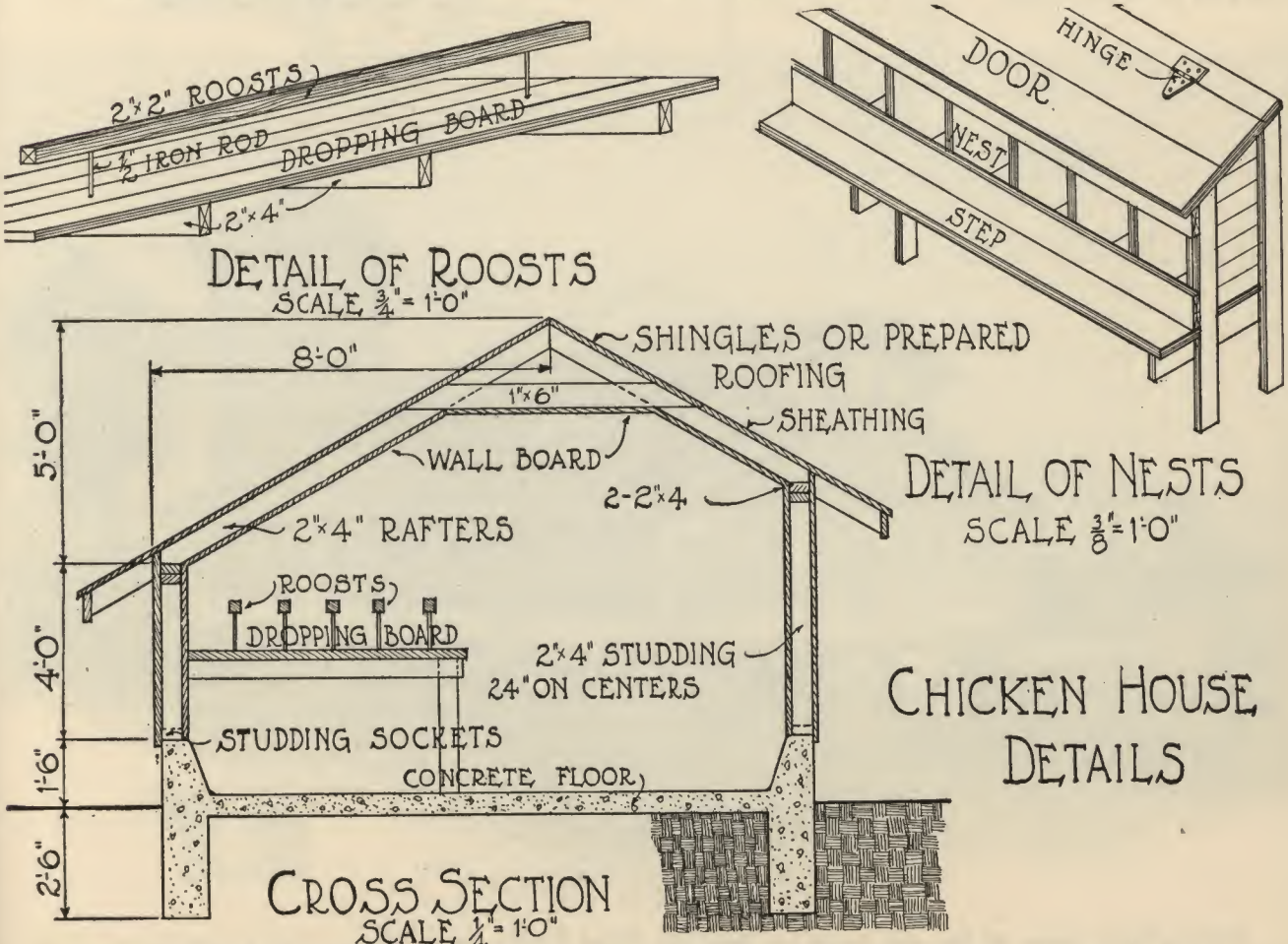
Corner boards—
2 pieces 1x3 — 4.
2 pieces 1x4 — 4.
2 pieces 1x3 — 6.
2 pieces 1x4 — 6.

Nests and Dropping Boards.

It would be well to discuss the method of construction before attempting to figure the quantities of materials needed for the work. While detail is given, the size is not definitely stated on the plans. They can be determined by careful figuring.

A partition also is called for, but there is nothing on the plan to show whether this is solid or made of wire.

Possibly no two estimates of material for this poultry house would be identical. If the work is carried along, each piece of material should be marked to show what it is for.



Working Details of Poultry House Construction (Design A338), 20 by 14 Feet in Size, Shown on Opposite Page.

CHAPTER XVIII.

TYPES OF FARM BUILDINGS

To the rigid economist it may be a matter of regret that the construction of farm buildings has not been reduced to a science. In that event plans and dimensions of barns, cow barns, poultry houses, hog houses, granaries and tool sheds would be standardized; all concerned would become familiar with established standards and would understand exactly what materials were needed and just how to proceed with the work.

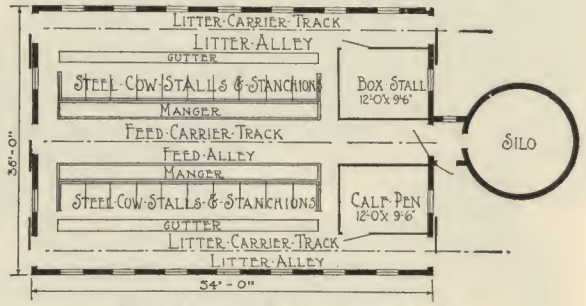
The builder and the material dealer are far from that blissful, nerve soothing condition. Taste in architecture, opinions respecting utility and the amount of money that can be spent in building show the widest possible variation. The outcome is that seldom, if ever, is the contractor or the lumber dealer asked to furnish an estimate of the cost of one farm building which is the exact duplicate of another structure built in the same neighborhood.

For these reasons a number of types of farm buildings are illustrated and certain suggestions made respecting the utility of the structure and the method of construction.

Design A301 is a 36x54 separate dairy stable with accommodations for twenty cows. The perspective shows concrete walls well up above the ground line. Reference to the cross section given on the opposite page shows a 2x1 foot footing and a 12-inch concrete wall (the latter sloping slightly from the floor to the sill on which the studding set), the total height being 4′ 6″.

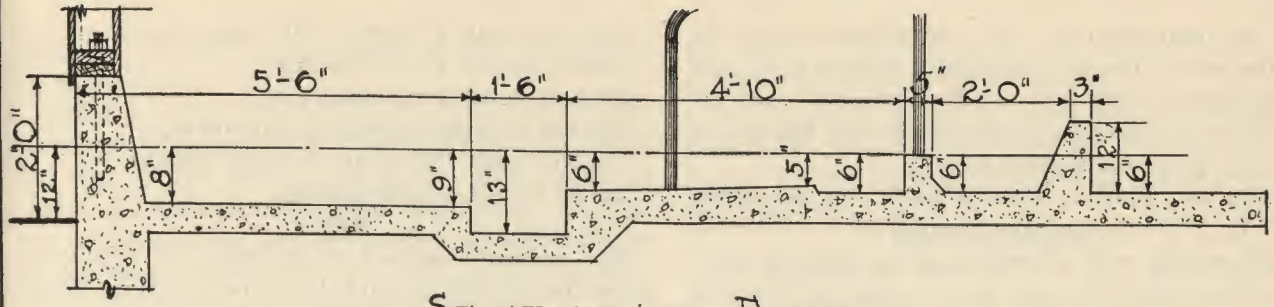
Figuring the Concrete.

Proceeding methodically, determine the distance around the structure, which is 36, plus 54, plus 36,

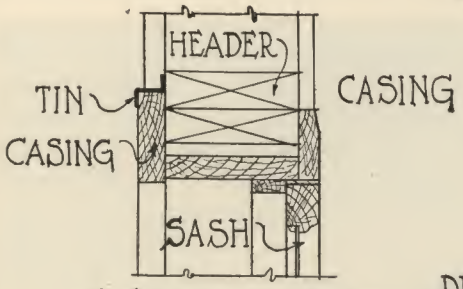


Floor Plan of Dairy Stable A301.

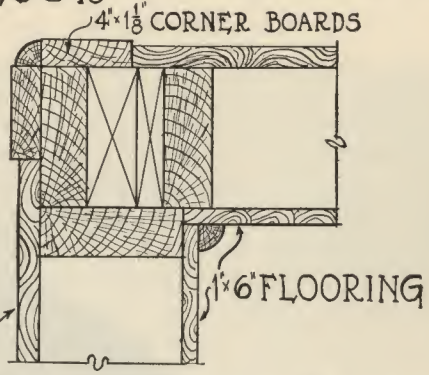
Separate Dairy Stable, 36 feet wide by 54 feet long. To House Twenty Cows. We can furnish complete set of blueprinted working plans and typewritten specifications for only $7.00 per set. When ordering, ask for Design No. A301.



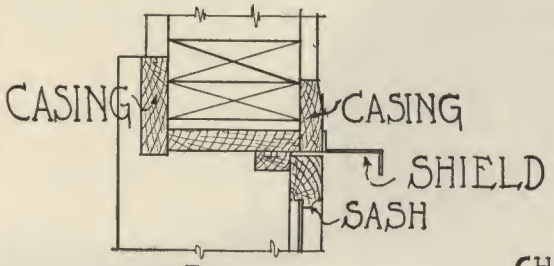
SECTION OF FLOOR
SCALE $\frac{3}{8}$"=1'-0"



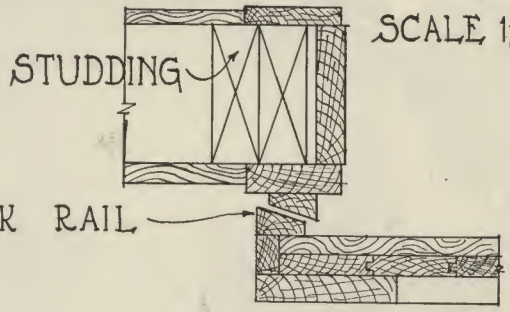
WINDOW HEAD



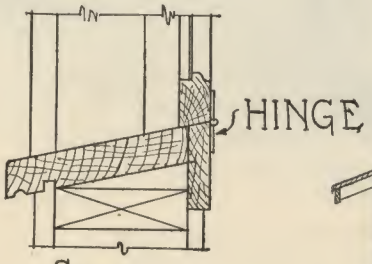
CORNER POST DETAILS
SCALE 1½"=1'-0"



JAMB



BARN DOOR DETAILS



SILL
SCALE 1½"=1'-0"

CROSS SECTION
SCALE $\frac{1}{8}$"=1'-0"

Working Detail Drawings of Separate Dairy Stable (Design No. A301), Illustrated on Opposite Page.

plus 54, total 180 feet. For convenience count the footing as two feet of wall height, making 6′ 6″ and multiplying by 180 gives 1,170 cubic feet. Add ¼, the difference between dry measure and tamped in concrete, gives 1,362 cubic feet.

There are sixteen concrete piers for the posts, 1′ 6″ by 1′ 6″ at the base, sloping to 1′ by 1′ and 2′ high which, with allowance, gives about 5 cubic feet of concrete for each pier, a total of 80 and a grand total of 1,442 cubic feet for piers and foundation.

18x1.50 equals 27 barrels, 108 bags cement.
18x0.47 equals 8½ yards sand.
18x1.10 equals 20 yards gravel.
For the wearing coat use the following:
18x.85 equals 15 barrels, 60 bags cement.
18x.24 equals 4½ yards sand.

Sills.

The ordinary method of figuring the sills is to allow for two 2x6 around the entire building, which would call for 360 linear feet of 2x6. There are four 4′ and two 3′ openings thru the concrete walls

A model 60-foot diameter round barn with sanitary tile walled basement to accommodate 40 cows. Milk room is built of concrete underneath the bridge to hay mow floor. The round barn is a winner—gives 25 per cent more accommodations at the same cost. We can furnish complete set of blue printed working plans and typewritten specifications for only $12.00 per set. When ordering ask for design A304.

One-eighth of the total number of cubic feet in a 1-2-5 mixture represents the number of bags of cement required. The calculation will show 180 bags.

There are 53 cubic yards in 1,442 cubic feet, of which ¼, or 13 cubic yards, is sand, and ⅝, or 35 yards, are gravel.

By using the table given on page 207 the material for the floor can be figured quickly. The dimensions inside the concrete walls are 34 by 52, giving a total of 1,768 square feet which we will figure as 18 squares, to allow for troughs. Figures follow:

for the doors, giving a total of 22, and as the sill is doubled this permits of a saving of 44 linear feet of 2x6, or 12.2 per cent. If the lumber is worth 3 cents a foot the dollar and cents saving would be $1.32.

The details and plans given do not permit a further inquiry into the quantities of materials required to construct this barn.

Practical Value.

This dairy stable offers certain conveniences that make it attractive to the dairyman.

Each alleyway is open to the yard by doors in

each end, so there is easy access to the stable from all directions.

There is a well made ceiling over the cow stable which gives eight feet headroom in the clear above the floor of the center feed alley. This ceiling is carefully constructed to make it airtight. Ventilation is given at the sides by putting ventilating flues in the walls, which carry the foul air up the slope of the roof to the center monitor windows.

Above the stable is a space that is usually filled at threshing time with straw for bedding. The straw is let down into the feed room between the stable and the silo, otherwise there is no connection between the stable and the storage room above. Careful dairymen object to having any kind of a storage room in connection with the dairy stable, because of the dust which floats about when the bedding or other roughage is dropped down. But the arrangement of dropping it into the feed room is not objectionable, because the doors are kept shut at such times and the dust is confined to the feed room.

The same chute is used to drop silage from the different silo doors as required. All outside doors are hung with special roller tracks, so they open and shut very easily and fasten with heavy iron fasteners, which may be operated from either the inside or outside.

POINTS ON BUILDING A ROUND BARN.

It is not necessary to give complete detailed information on estimating and constructing each building illustrated. There are certain points to be taken into account in handling the various types of buildings which should not be overlooked.

A barn built in circular formation around a well constructed silo is one of the more interesting types of buildings to which attention is directed. A careful estimate shows the dairyman will get 35 to 40 per cent more for his money when he invests in this class of structure.

In taking off a bill of materials for this structure or in erecting the building attention first should be given to the silo.

Foundation.

If a firm stratum of clay, sand or gravel is found near the surface it will not be necessary to put the silo foundation walls in so deep. This foundation is entirely enclosed and protected by the outside foundation. It will be poor practice, however, to set the footings on black earth.

The circular foundation for the silo should be brought up to a level of the underside of the concrete bottom of the sill. After the concrete has set firmly the inner form should be removed and the bottom dished, as shown on the plan. The concrete floor should then be laid. Time and expense can be saved by running the outer form for the foundation wall to full height, thus requiring only one setting of this form. The floor of the silo should be laid in one piece. Work on the outer foundation walls and piers can proceed at the same time.

In estimating figure the outer wall as 190 feet in length and the silo foundation as 50 feet in length. If they are put in to the same depth, the figures may be combined.

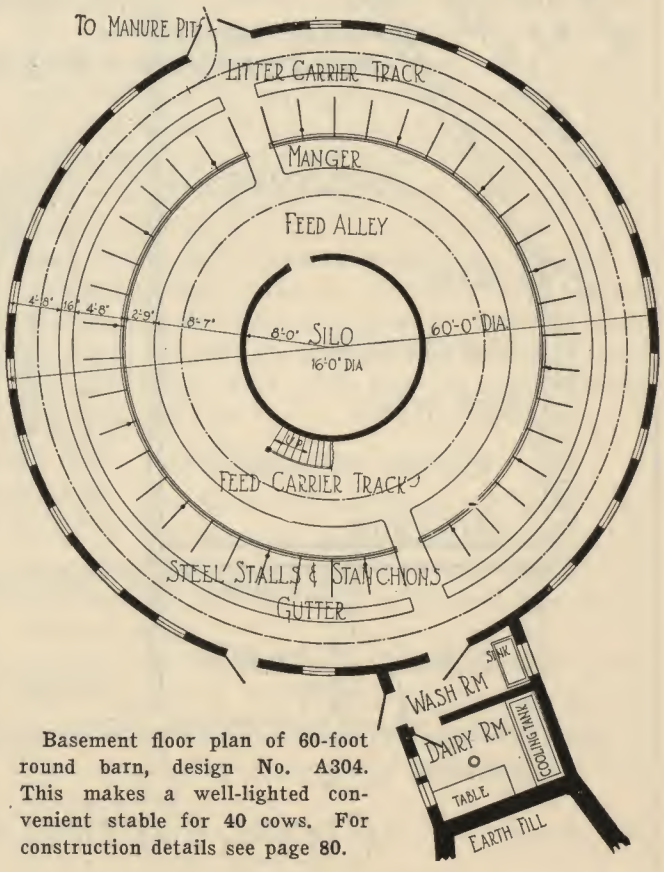
Silo Construction.

Building up the nail girts for the silo is the first problem encountered. These are made of ¾x2½″ battens. The call is for a silo 16 feet in diameter in the clear, so allowance must be made for two thicknesses of flooring. The inside circle of the girts should therefore be 16′ 1¾″. Build up substantial stays that will not be displaced by the shock of nailing and around them bend the battens and nail them securely together.

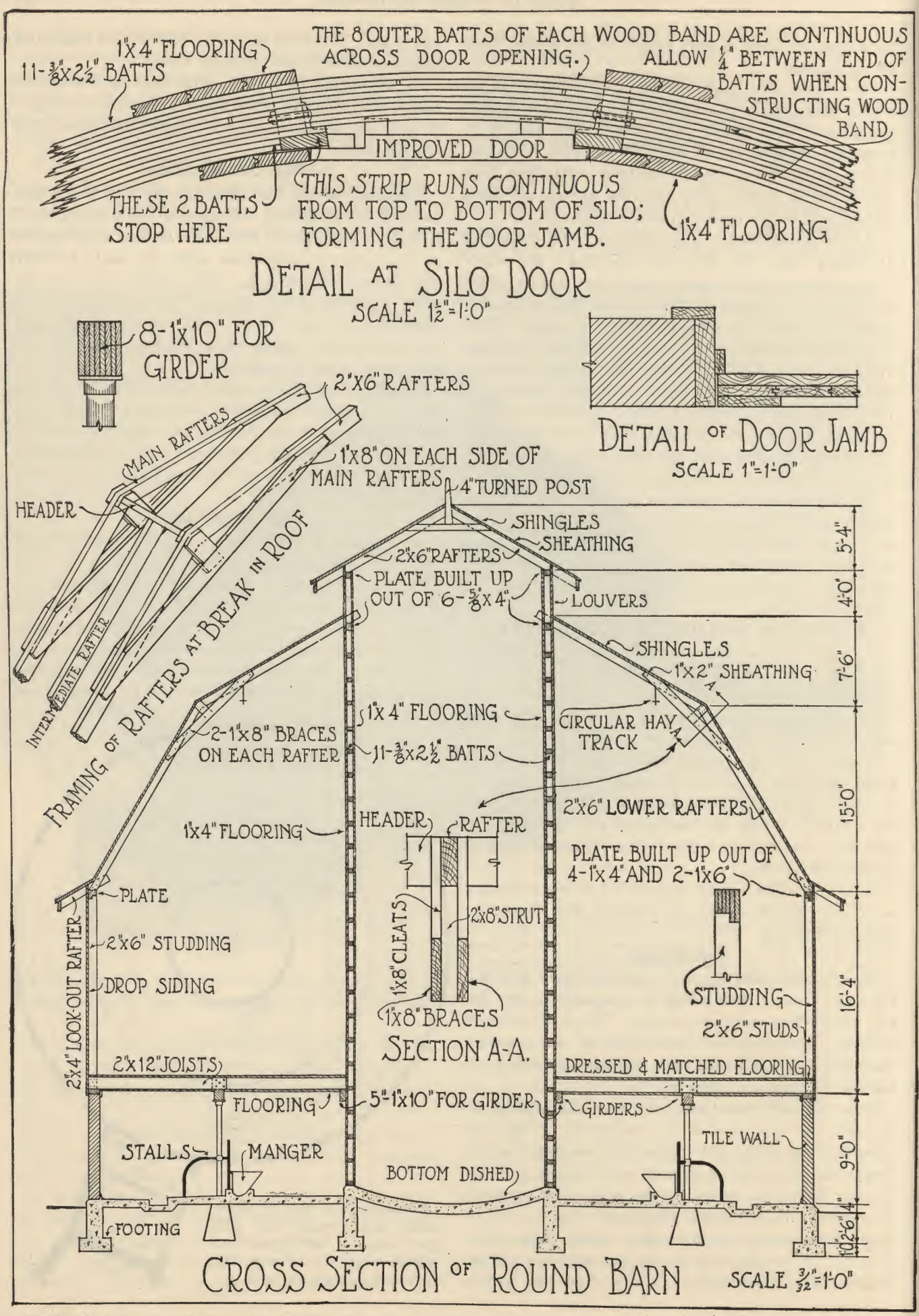
Cross section of the round barn shows 25 nailing girts, composed of eleven members, which will average about 52 feet in length. Almost any length 10 feet and longer may be used, but a combination of three 12-foot and one 16-foot piece would work to the best advantage.

Nailing the Girts.

These girts should be made of soft wood of good quality. A good quality of shortleaf pine or white pine is recommended. After the girts are complete they should be nailed from the inner side with 10d nails. It will be necessary to use small nails to hold the first three or four members in place, but as the thickness of the girts increases larger nails should be employed. The battens should be brought up



Basement floor plan of 60-foot round barn, design No. A304. This makes a well-lighted convenient stable for 40 cows. For construction details see page 80.



Details of 60-Foot Round Barn with Tile-Wall Basement and "Home-Made" Stave Silo, Design No. A304, Shown on Opposite Page.

tight before the nails are started. When all the girts are complete they must be put in place and stayed. If possible select a time when there is very little wind. There will be ample material on the ground for scaffolding and stays.

Flooring for Silo.

A good grade of well matched flooring should be used. Unrolling the circle and deducting the openings on the inner and outer sides would give a surface approximately 52x100 feet, a total of 5,200 feet. Adding one-fourth for loss in dressing gives 6,500 feet of flooring. That quantity also should be sufficient to make single thickness doors, but as double thickness are required an additional 100 feet should be added, making 6,600 feet of flooring.

End matched stock of soft texture is recommended and if possible heart stock should be used, at least for the inside of the silo. If it is not possible to secure end-matched pine flooring the joints of the inner lining of the silo should be mitered, not butted, and the miter should slope toward the inside of the silo. Almost any length of flooring can be used, as the nailing girts are spaced two feet on center, but 6-, 8-, 10- and 12-foot stock can be handled with greater ease and rapidity than the longer lengths.

Building Up the Girder.

The girder made up of five pieces of 1x10, which furnishes support for the joist where they butt against the silo, should be built in position. It might be advisable to drop the nailing girt of the silo a few inches to give a solid section to receive the nails.

The intermediate girder may be built up on the barn floor and raised to position. The sill capping the outer wall is built up, in position, of eight pieces of 1x4, which makes for strength and low cost of construction. The floor is laid in four sections.

Figuring the Flooring.

The radius of the barn is 60 feet, the circumference, for practical purposes, 190. Multiplying the two gives 11,400, one-half of which represents the floor space to be covered with flooring. From that figure, 5,700 square feet, must be deducted the area of the space occupied by the silo which, a calculation will show is 450 square feet, leaving 5,250, to which one-fourth is added to cover loss in matching, giving a total of 6,562 feet of flooring. It would be well to make an allowance for waste and to figure the flooring needed at 6,700 feet.

At the break in the roof a header is cut in between the main rafters, as shown in the detail, and in the lower section a rafter is placed between, thus giving twice as many rafters in the lower as in the upper section of the roof.

The roof is sheathed with 1x2 strips, laid accurately, and the shingles are laid by the boards, no chalk line being necessary. The roof boards should be spaced accurately for this purpose.

The Round Barn's Practical Value.

The round barn is a comparatively new thing to the builder, and for this reason some hesitate in undertaking the work of erecting the building. The work of building a round barn is no more complicated than building a rectangular building and as the round barn is the coming thing, every builder should study into it; he will find no difficulty in erecting it after a careful study of the plans and details.

The first thing to consider in the erection of a barn or other farm building is a convenient arrangement for the purpose intended. Many steps and a great deal of time can be saved if the building is properly planned.

One of the great advantages of a round barn over a rectangular barn is in the work of distributing silage and other feed to the cows. The feeding starts at the silo door where the silage is thrown down, and is continued around a circle ending at the door ready for the next feeding. The same is true when cleaning out the stable, using the litter carrier, which runs on a circular track back of the cows.

The silo is located in the center of the barn, where it occupies the space that is least valuable for other purposes, and at the same time forms a support for the roof. The silo is of the home-made type, built all of wood and that, too, of stock material, that the builder or farmer can purchase anywhere. The round construction gives great strength on account of the bracing effect resulting from the concentration of the framing timbers supporting the roof. As shown in the details, there are no timbers whatever obstructing the large mow. The circular construction is the strongest because every board around the barn acts as a brace, the same as a hoop on a barrel. It is the best type of construction to resist wind pressure, as the wind, in striking the surface, glances off and gets no direct hold on the roof or walls, as it can on a rectangular building.

The hay carrier runs on a circular track around the mow and drops the hay wherever desired. Thus in no instance does the hay have to be moved more than a few feet, which means a saving of much labor during haying time.

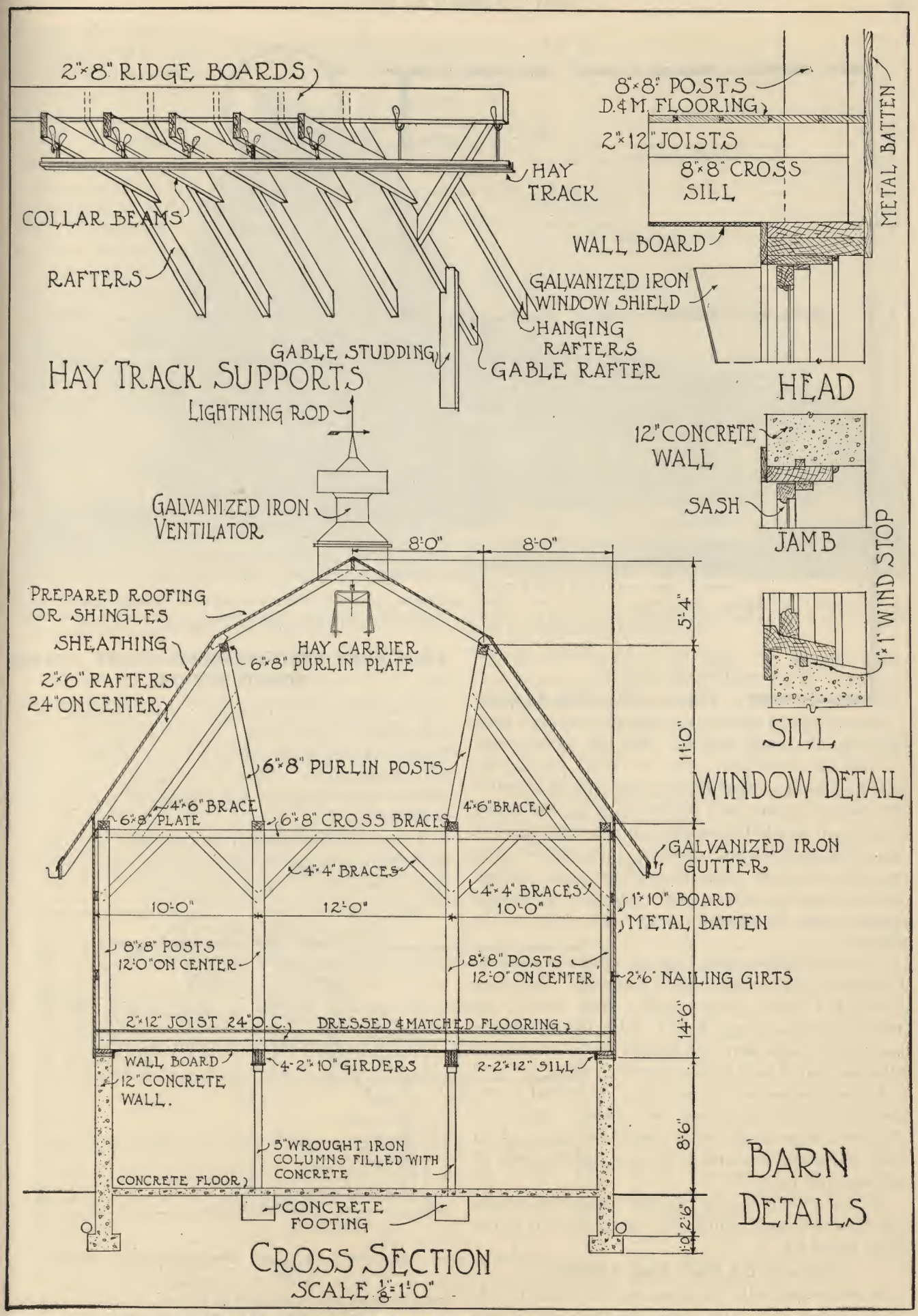
BUILDING FOR UTILITY.

A plan for a farm building should not be read entirely for the technical information relating to the amount of labor or material required to construct it, but the practical or use value of the building should be considered.

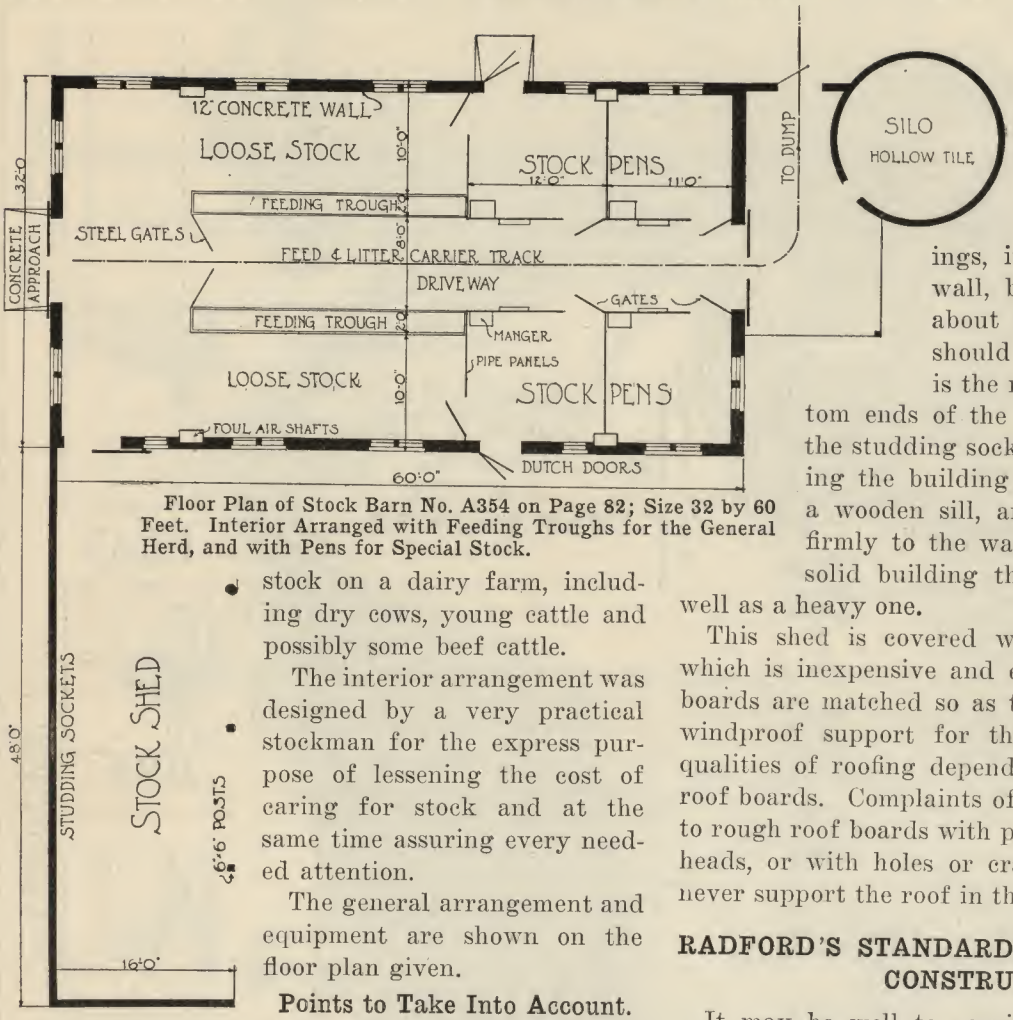
Frequently the lumberman or the contractor can offer a suggestion that will prove of great value to the owner. A stock shed is one idea that could be fitted to the varying needs of many farmers and dairymen.

This barn was built to house the unproductive

Photographic Architectural View of Beef Cattle Barn as Planned for Farm of Average Size. This is a Concrete Basement Barn, 32 by 60 Feet, of Heavy Timber Construction; High Gambrel Roof; Stock Shed Extends out 48 Feet, Shutting Out the West Winds from the Barnyard. When Writing in Regard to This Design, Please Refer to No. A 354. For Dimensioned Floor Plan and Details of Construction, See Pages 83 and 84.



Details of Heavy Timber Framing for Stock Barn No. A354, Illustrated on Page 82.



Floor Plan of Stock Barn No. A354 on Page 82; Size 32 by 60 Feet. Interior Arranged with Feeding Troughs for the General Herd, and with Pens for Special Stock.

stock on a dairy farm, including dry cows, young cattle and possibly some beef cattle.

The interior arrangement was designed by a very practical stockman for the express purpose of lessening the cost of caring for stock and at the same time assuring every needed attention.

The general arrangement and equipment are shown on the floor plan given.

Points to Take Into Account.

Several points should be taken into account when studying the cross section. The two girders supporting the first-floor joists are built up of four pieces of 2x10. Joists 10 feet long may be supplied for the side spans and 12 feet long for the center span or, if the bill is shipped direct from the mill on order, and the mill prefers, joist 22 feet long may be furnished. Sometimes there is an accumulation of certain lengths at the mills and the longer lengths may be secured at the same price as the shorter.

This barn is framed and proper allowances should be made in taking off a bill of materials. Referring to the 4x4 braces, shown on the cross section, the visible length is about 5 feet. The dotted lines on plates and posts show the braces are morticed and allowances of 7 to 9 inches should be made.

The nailing girts for the siding are spiked to the posts instead of being cut in between. The o. c. distances between the posts should be measured on both end and side sections and the right lengths of nailing girts noted.

It is relatively easy to take off a bill of materials for the stock shed, built in the form of an ell to the main structure.

Value of the Stock Shed Addition.

In connection with the stock barn is a shed shelter to protect young stock from the cold north winds and from cold soaking rains. This shed is not expensive to build, but it is a great convenience and a great comfort to the cattle.

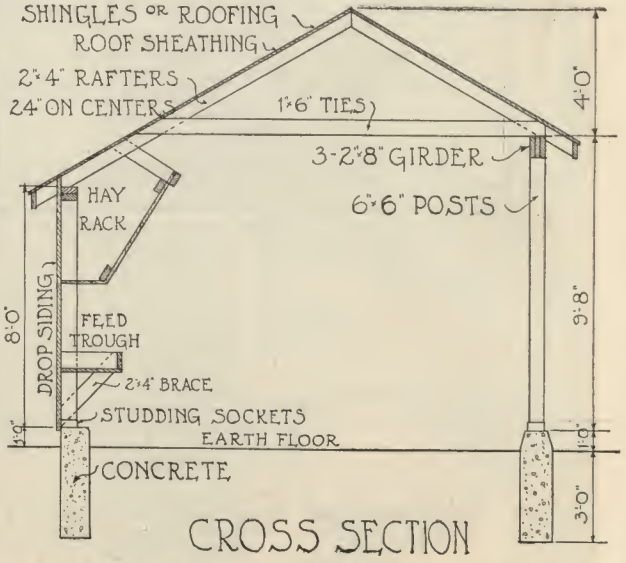
Like the other buildings, it is built on a concrete wall, but there is one feature about the construction which should be mentioned, and that is the manner in which the bottom ends of the studding are fitted into the studding sockets. This way of fastening the building to the wall saves using a wooden sill, and it anchors each stud firmly to the wall, which makes a cheap solid building that resists the winds as well as a heavy one.

This shed is covered with a prepared roofing, which is inexpensive and easily put on. The roof boards are matched so as to make a smooth, tight, windproof support for the roofing. The lasting qualities of roofing depends a great deal upon the roof boards. Complaints of roofing often are traced to rough roof boards with protruding knots and nail heads, or with holes or cracks. Such roof boards never support the roof in the proper manner.

RADFORD'S STANDARDIZED PLANK FRAME CONSTRUCTION.

It may be well to consider barn building on a somewhat different basis. In preceding pages something was said about the lack of a standard of type and construction. That is absolutely true with respect to practice, but it is a handicap that is being overcome.

A careful consideration of the plans, and discussion of the same, given here, should prove enlightening to many dealers and contractors.



Detail of Stock Shed Illustrated on Page 82, Showing Hay Rack and Feed Trough as Frequently Built.

Photograph of Modern Barn, size 72 by 42 feet. A modern barn in every respect, completely outfitted with the best barn specialties and sanitary labor-saving equipment. Design No. A368. We can furnish blueprinted working plans of this building to any desiring them for only $7.00 per set.

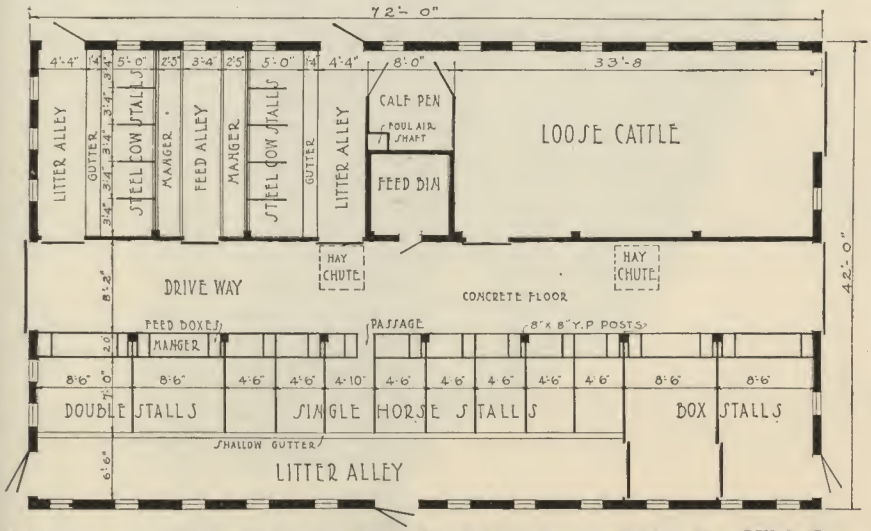
Combination Barn and Cow Shed.

The best of the plank framing methods for self-supporting barn roofs is illustrated in the accompanying photographs and working drawings. It is the result of a critical study and comparison of all the various "plank frame" or "joist frame" construction methods that have been offered in recent years. It has the advantage of simplicity, ease of construction and well-balanced strength.

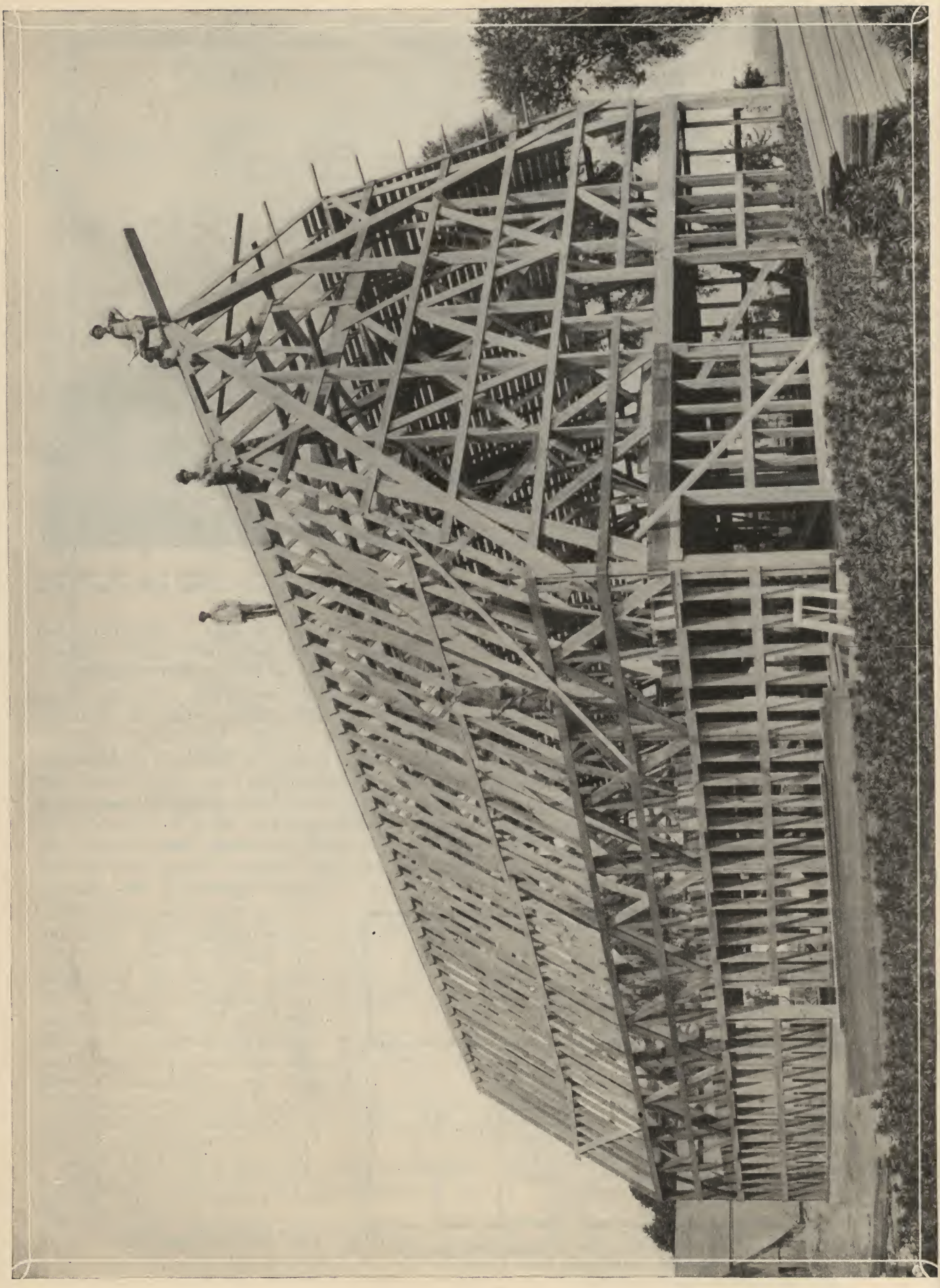
This style of barn framing has been given the name of "Radford's Standardized Plank Frame Construction" in recognition of the pioneer work that William A. Radford has done in developing and standardizing modern barn architecture. Designed by the barn experts in Mr. Radford's organization this system is rapidly coming into use in the central west. It is not patented; any builder is privileged to use it.

The essential feature in Radford's Standardized Plank Frame Construction is the truss, built up out of 2 by 10, 2 by 8 and 2 by 6 planks, all commercial sizes of timber carried in stock by every lumber dealer. These trusses are evenly spaced thruout the length of the barn, usually coming about 12 feet apart. Unlike some other systems of plank frame construction, these trusses extend down below the barn floor to the basement foundation, in this way preventing any weakness at the line of the floor joists. The means of accomplishing this is simply to run the wall studs at each truss clear thru from foundation to roof plate. Two of these long studs, 2 by 8's, are used, and then they are further reinforced below by two short studs spiked fast to them.

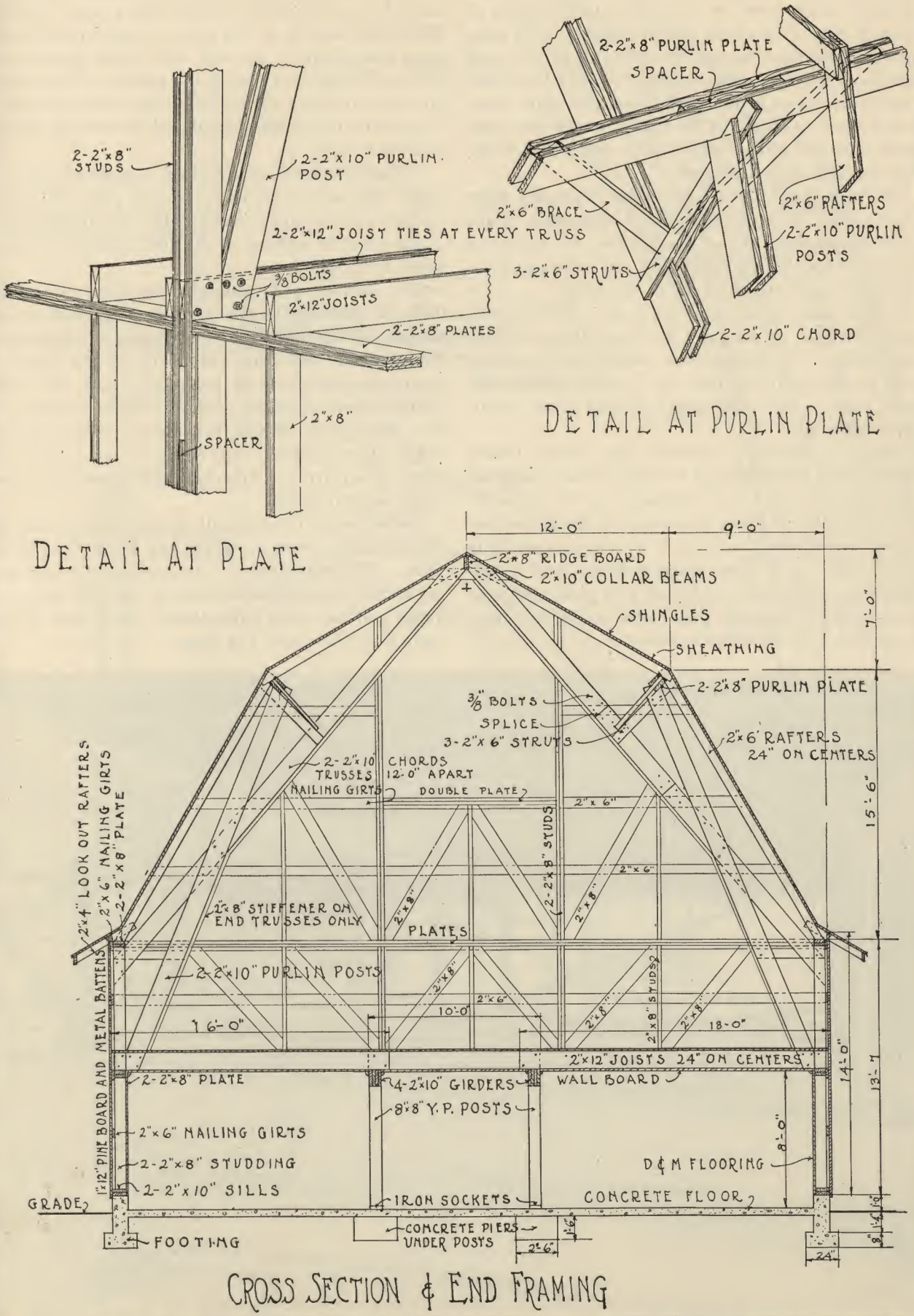
This gives the roof trusses a good strong anchorage to the lower part of the barn frame, and puts the strength where it is needed.



Arrangement of Ground Floor of Barn No. A368, Accommodating Ten Milch Cows, Twelve Horses, and Considerable Loose Stock.



Did You Ever See a Finer Looking Barn Frame than This? It is an Example of "Radford's Standardized Plank Frame Construction," Erected Near Atkinson, Ill., Following Plans and Specifications Prepared by the Radford Architectural Company, Chicago, Design No. A386. For Photograph of Finished Barn, Dimension Floor Plan and Details of Construction, See Pages 85 and 87.



Detail Plate Showing How to Build "Radford's Standardized Plank Frame Construction" on a 42-Foot Span, 13-Foot Studs. For Photograph of this Barn Erected, see Page 86.

The purlin posts consist of two 2 by 10's, and run up on an angle from the floor plate to the brake of the roof, where the purlin plate is located. The truss chord is built up of two thicknesses of 2 by 10's, and runs from just below the roof plate up to the ridge. Three 2 by 6-inch struts from the purlin plate down to the chord to stay it; 2 by 6-inch braces also come down from the purlin plate to the chord at a 45-degree angle to stay it laterally.

The ridge board is a 2 by 8, and there are 2 by 10-inch collar beams at the peak of each truss. Each truss is tied securely at the bottom by means of doubled 2 by 12-inch joists securely bolted and extending across thru the floor of the barn.

In this truss ⅜-inch carriage bolts with cut washers underneath all nuts are used for all connections and splices. No dependence should be placed on nails or spikes in building up a truss. Spikes will work loose in time, whereas a bolted joint can be depended upon.

Barns of Radford's Standardized Plank Frame Construction are very easy to erect. The trusses are laid out and completely assembled on the ground; then when the concrete foundation is ready the end truss is raised and held plumb with braces and guy ropes. The next truss is then raised and immediately the section of 2 by 8-inch wall plate is slipped in and nailed fast, and that holds the second truss in position. So on with the others.

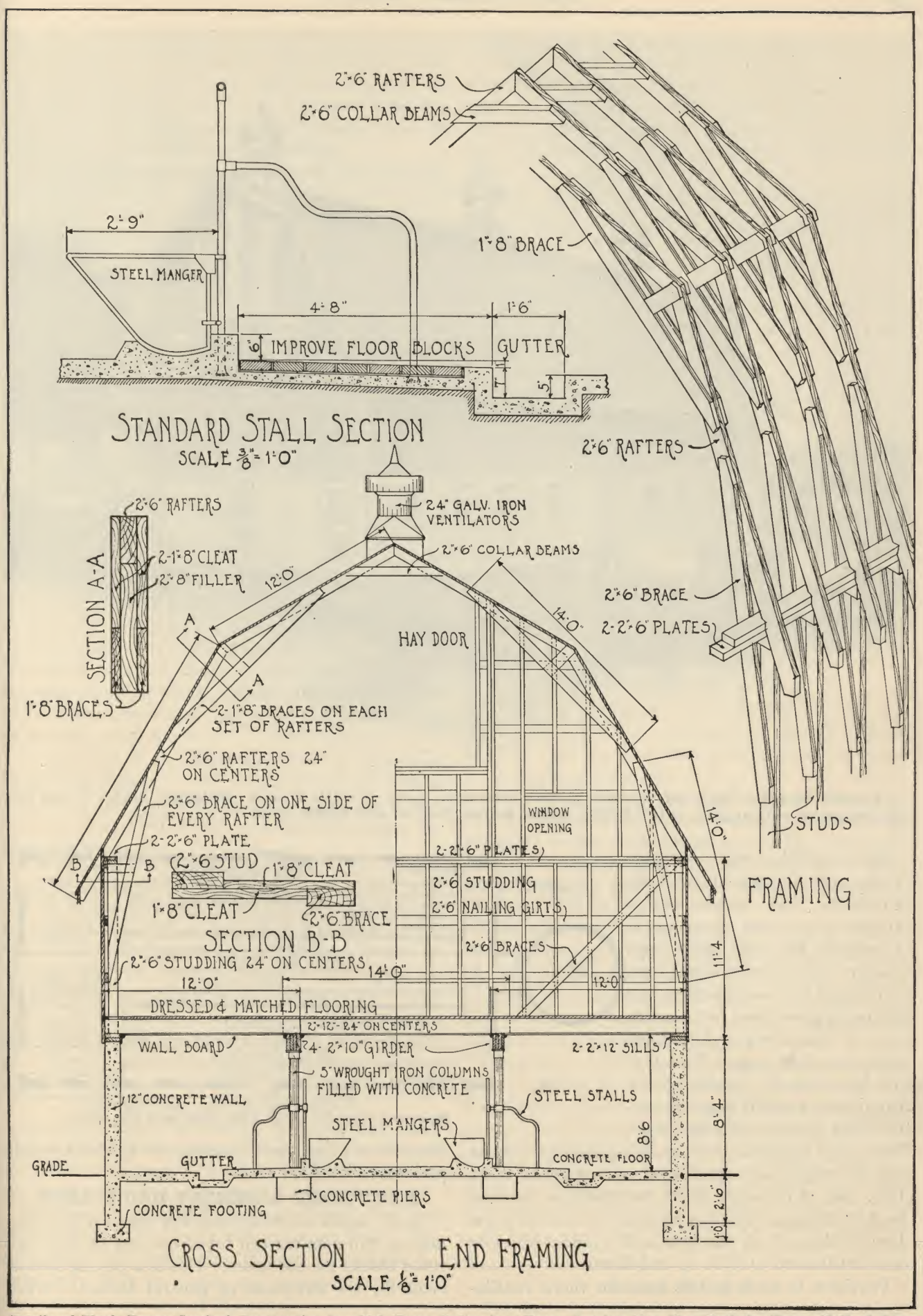
When all the trusses are up the roof plates are nailed on, and then the ridge board put in. A 2-inch block was laid in at the peak of each truss when it was assembled to prevent the ridge board space from pinching shut during the raising. These blocks are now knocked out and the ridge board driven in. The purlin plates are next placed and braced, and the rafters put on.

All of the work of building a barn of this type goes right ahead step by step, no part of it being so heavy as to require extra help. The old fashioned raising bee is a thing of the past with this type of barn framing.

The detailed plate shows the end framing of this barn in addition to the typical truss that is illustrated. Notice that 2 by 8-inch stiffeners are specified for the end truss only. These are nailed on along the underside of the purlin post and chord, being placed at right angles to these timbers. In the photograph of this barn frame these stiffeners make these members appear as heavy square timbers. They are not, however. They are box girders open on two sides.

In the detail drawing all of the timbers indicated inside of the truss members are in the end of the barn. With this type of construction, the hay mow is entirely free and unobstructed, save for the purlin posts and the main truss chords; and these project only a few feet into the mow.

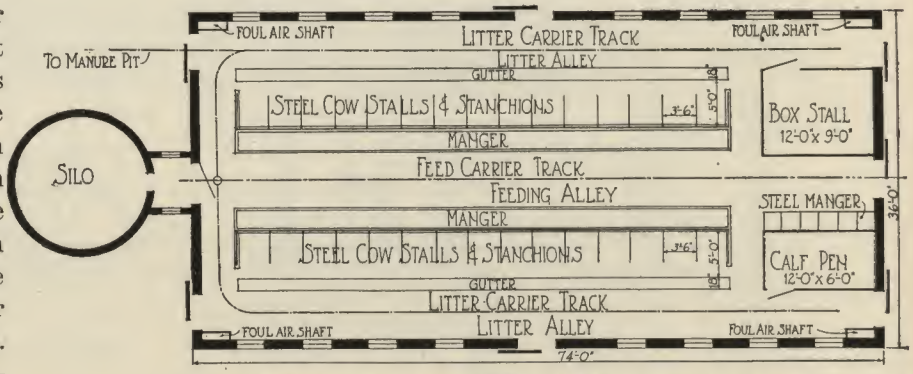
View of Basement Stable in the Barn No. A368 During Construction. Concrete Cow Manger in the Foreground.



Details of Plank Frame Gambrel Construction in which Every Rafter is a Truss, Leaving Hay Mow Entirely Clear. Half of Cross Section View Shows End Framing. Design No. A299 Illustrated on Page 90.

Concrete basement dairy barn of very popular, substantial design, to stable 30 cows. Design No. A299. We can furnish blueprinted working plans of this building to any desiring them for only $10.00 per set.

The foundation walls and floor of the barn illustrated are built of concrete. The concrete wall is carried up one foot above grade to protect the wall sills from moisture. The interior of the barn is arranged very conveniently, one side being given over to ten milch cows in stanchions and to loose cattle in a large pen. The other side has stalls for twelve horses. A driveway extends thru the center of the barn on the stable floor. There is no driveway or "thrashing floor" above, as that is considered extravagant use of space these days. All of the space above the stable is available for hay storage. The hay is taken in thru the big door at the end of the barn in the peak, which is counterbalanced to slide up and down.



Basement floor plan of 74' x 36' dairy barn, No. A299.

Provision is made in this barn for thoro ventilation; and a generous number of windows admit plenty of sunlight.

A CONCRETE BASEMENT DAIRY BARN.

In the detail showing standard stall section lumbermen will note the call for a covering of improved wood blocks for the floors. This is a paying investment for the dairyman or general farmer. When

the concrete is covered with wood it does not require so much litter to bed the animals properly, the wood covering serving as insulation between the animal and the heat absorbing concrete. This is a detail in barn construction that properly may be urged on all who contemplate building.

In the cross section it will be noted that studding are called for. These run to the square of the barn where they are capped by a plate, and other studding continue from that point to the rafters. The studding are spaced two feet on centers. The same size of material, 2 by 6, are used for nailing girts.

There is very little information on the best methods of ascertaining the quantities of material required for this barn that has not been explained heretofore.

Ventilating Flues.

One practical phase of all the barn plans given, however, is worthy of again receiving attention. That is the ventilating system. If these are incorrectly built they will not operate and will prove a useless expense and incumbrance.

The flues of the ventilating system are built to size of two thicknesses of dressed and matched stock. There are one to six of these in the modern barn. The foul air shafts start a short distance above the floor and follow the walls and roof to the ventilators on the ridge. The length is governed by the height of the structure, but usually are forty feet or longer. The inside of a flue 12x22, inside measurement, can be made of 4-foot stock without waste, and it is of advantage to the dealer to sell and to the contractor to use the short lumber.

That is one of the benefits derived by those who learn to read plans. To the educated eye these things will stand forth prominently and when the opportunity is perceived it will be improved almost unconsciously.

Estimating the Flues.

A flue measuring 12x22 inches in the clear will use 4-foot stock without waste, the end pieces being made 12″ long and the side pieces 24″ long. Then comes the paper and the outer boarding. It is well in these cases to reverse the lap, so the lengths required would be (approximately) 14″ and 24″. Any length will cut to advantage for the sides. For the ends 14-foot stock should be furnished, which length (or 7-foot, if ordered special) can be used without waste.

Conveniences and Appointments.

This dairy stable and storage barn contains all of the modern improvements that have been worked out to help dairymen to produce large quantities of clean, sanitary milk at a profit.

The lower story is built of concrete from 3½ feet below grade to 9 feet above the stable floor. The ground for the foundation is first tile drained to make sure that no water can accumulate around the building any time of the year.

The way in which the concrete walls are built will depend on the kind of material that may be secured to the best advantage. Usually trenches are dug for the foundation walls, which widen out at the bottom for the footings. On ordinary soils 18 inches in width makes a good footing for a wall of this kind.

Above grade it is necessary to have both inside and outside forms. Besides being thoroly well braced it is better to have these forms wired together at intervals to prevent spreading.

At the proper height the door frames and window frames are inserted into the forms. If the forms are made the exact thickness of the wall they are easily placed.

The center feed alley, mangers, standing floor, gutter and alleys at the rear of the cows are all made solid together in one big floor of concrete finished with a rich cement surface.

The stable is served with a feed carrier which runs from the silo thru the alley to dump feed into both mangers, box stall and calf pen. The same overhead track extends thru the alleys behind the cows for the manure carrier, which dumps directly into the spreader at the manure pit.

The storage barn is built of plank frame construction in the usual way with hay fork and carrier track suspended from the short collar beams close up under the peak.

General Utility Farm Barn.

Ordinarily a barn is a carefully thought out and worked out project. Lumbermen should handle them in that way and thereby save their customers a bit on the lumber bill.

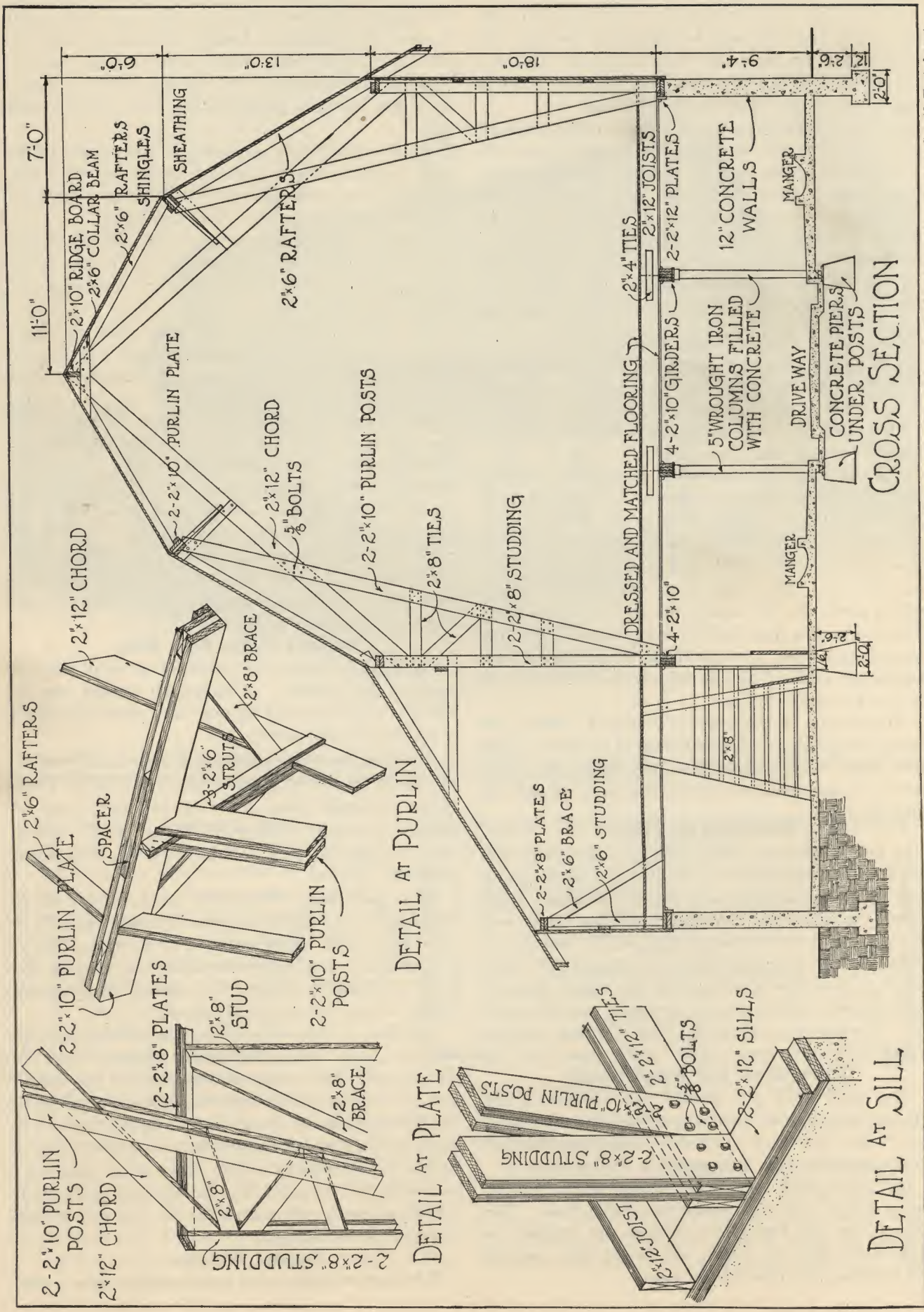
Studying the cross section of Design A-298 a number of purlin ties and braces will be noticed. These range in length from three to five feet, some of the exact lengths being 3′, 3′ 6″ and 4′ 6″. Naturally 6′ and 8′ stock can be used or, if desired, multiples thereof.

There is a custom of tendency on the part of those who figure lumber bills to order so many linear feet or so many feet, board measure, of a certain dimension and later the lengths furnished are used to the best advantage possible. To correct this custom means to save material and money.

Studding 7′ long will be required for the lean-to over the horse barn. Ordinarily lumber is cut to even lengths; hence this particular size is not standard, but occasionally the mills accumulate a quantity of odd length stock. It is safest to figure this as 14′ stock, then to make inquiry for the special length. Fourteen foot lengths of 2x8 also can be used economically for the partitions in the horse barn, but a 12-foot length will suffice for the top two pieces that stop at the manger.

General Features.

This barn is designed to accommodate dairy cows



Details of Construction of Concrete Basement Farm Barn, Design No. A298, Illustrated on Opposite Page. Note Self-Supporting Plank Frame Roof Construction Trusses Set 12 Feet Apart.

General Farm Barn with concrete basement and self-supporting roof. Horse stable in lean-to. Design No. A298. We can furnish blueprinted working plans of this building to any desiring them for only $8.00 per set.

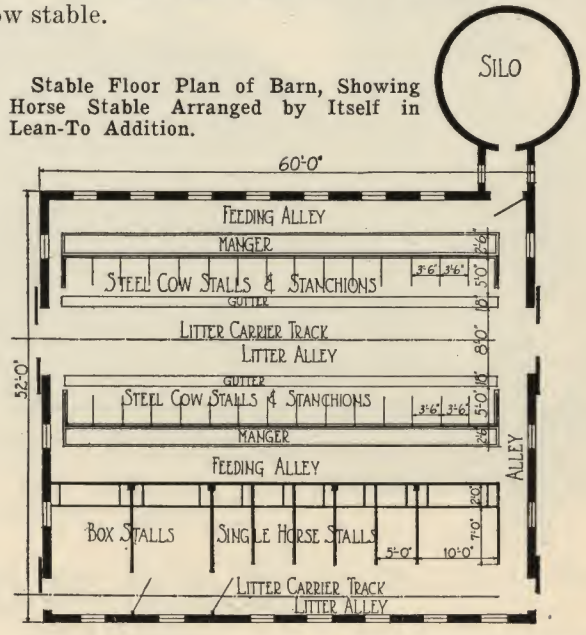
and farm horses and to keep the two stables entirely separate. Accommodations for 28 cows and ten horses are provided.

As shown by the perspective and floor plan, the horse stable is built as an annex to the cow barn by extending the roof.

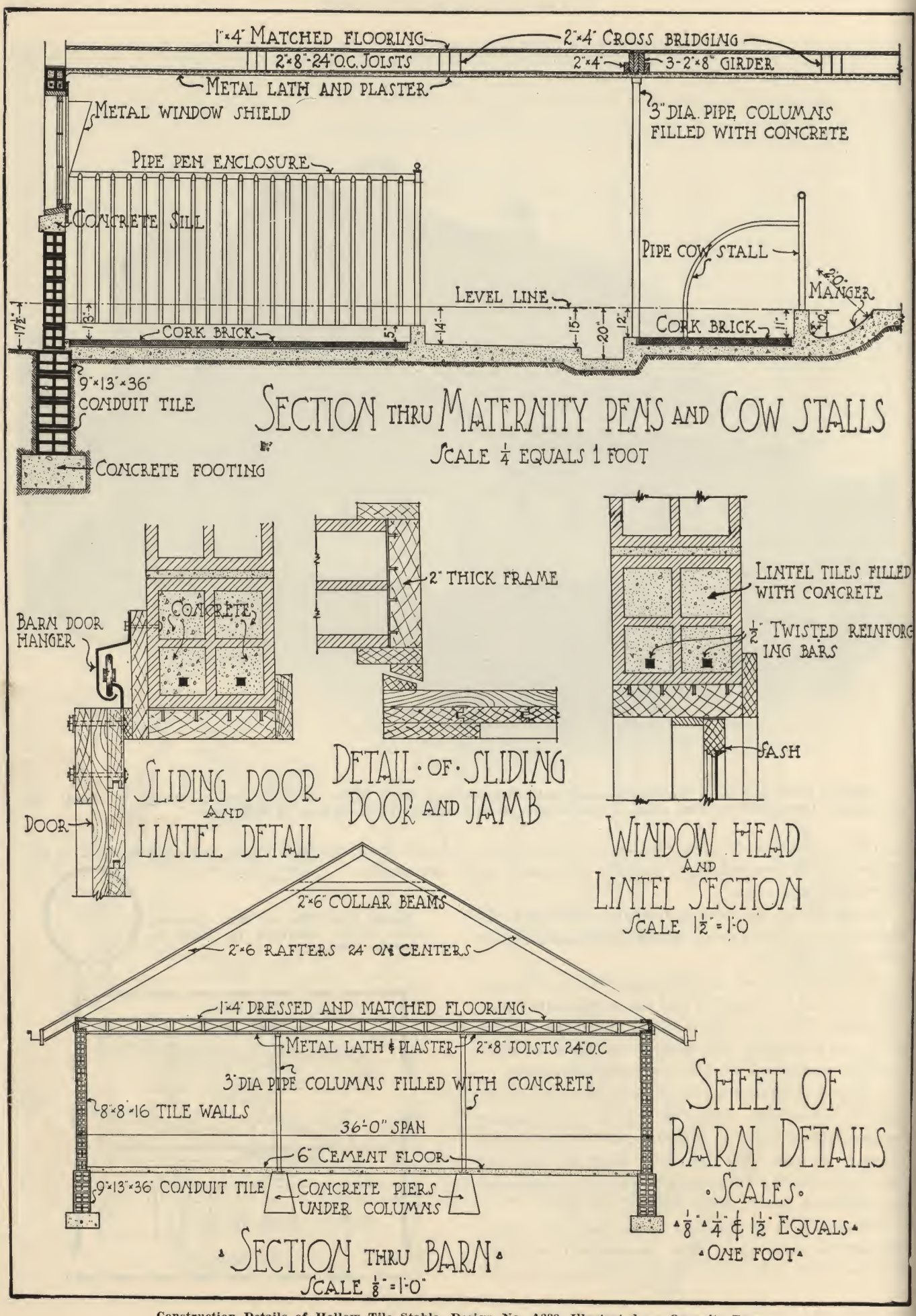
The barn is 52 feet in width and 60 feet in length. The cow stable proper is laid out with stalls facing outward. This is done to bring the horse feeding alley and one of the cow mangers to face each other, so the feeding may be done to better advantage.

The silo is placed on the cow stable side of the barn because more silage is fed to cows than to horses. However, if the silage carrier is placed right it may be run thru the side alley to the feed alley between the horses and cows so the silage may be delivered on the other side of the alley.

The stable is of concrete up to the joists which support the barn floor. The concrete wall is 10 feet 6 inches high, which gives ample footings to reach below frost and also eight feet of headroom in the cow stable.



Stable Floor Plan of Barn, Showing Horse Stable Arranged by Itself in Lean-To Addition.

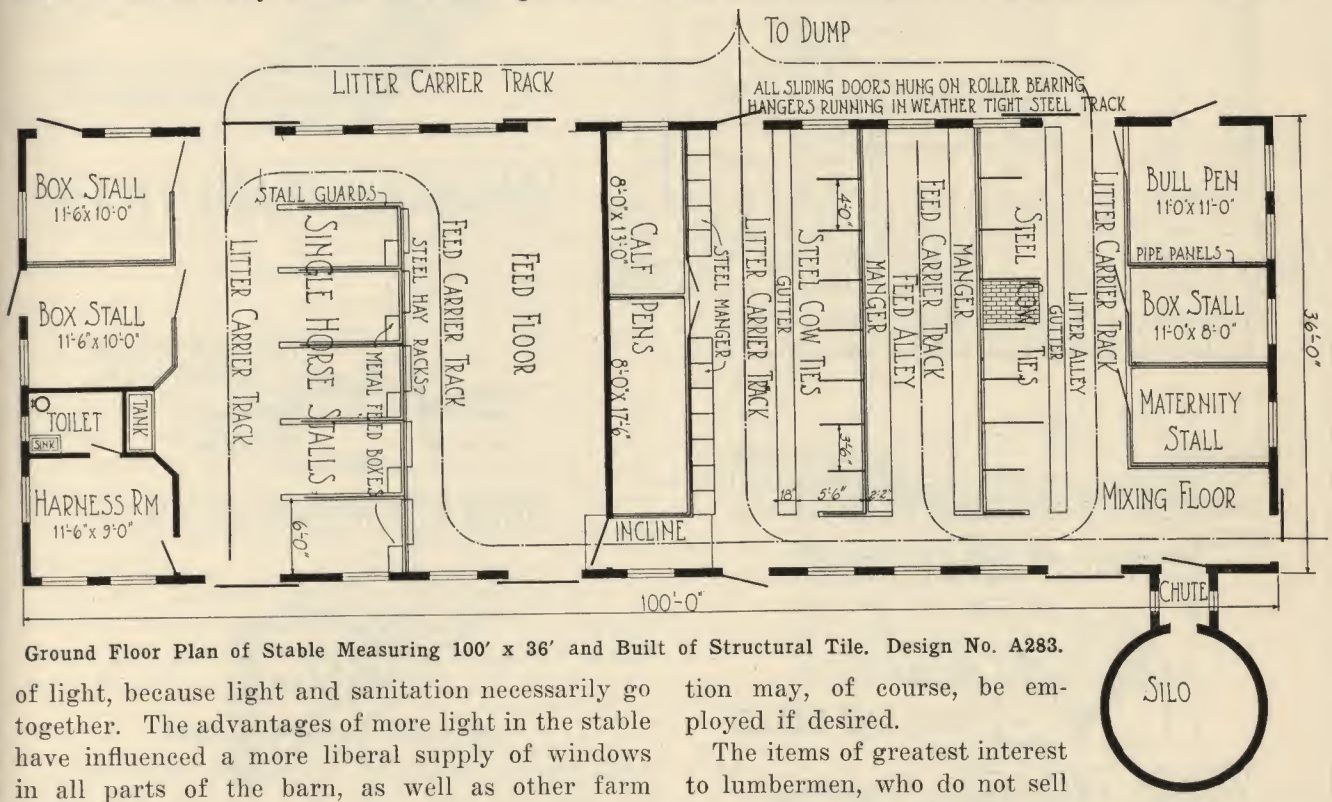


Construction Details of Hollow Tile Stable, Design No. A283, Illustrated on Opposite Page.

There are twenty windows in the stable and six windows to light the barn above the stable. Farmers are becoming more liberal in the supplying of windows. Modern dairy stables demand a great deal of light, because light and sanitation necessarily go together. The advantages of more light in the stable have influenced a more liberal supply of windows in all parts of the barn, as well as other farm buildings.

A ONE STORY GENERAL UTILITY BARN.

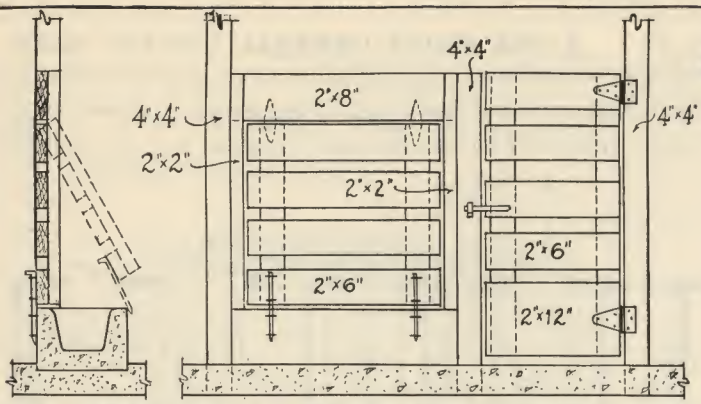
Here is an exceptionally good plan for a one story general purpose barn. The design is shown worked out with hollow tile, but frame or concrete construction may, of course, be employed if desired.



Ground Floor Plan of Stable Measuring 100′ x 36′ and Built of Structural Tile. Design No. A283.

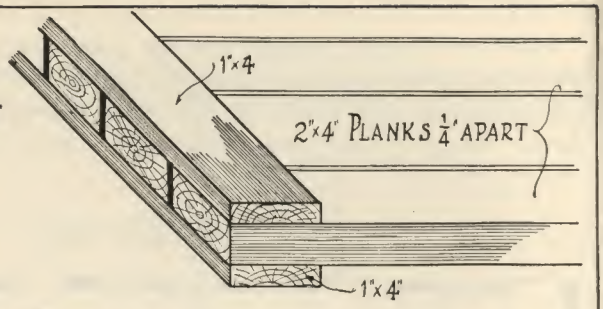
The items of greatest interest to lumbermen, who do not sell tile, are the joists, flooring, doors and windows and

Hollow tile one-story stable for beef cattle and horses. Size, 100 by 36 feet. Design No. A283. We can furnish blueprinted working plans of this building to any desiring them for only $10.00 per set.

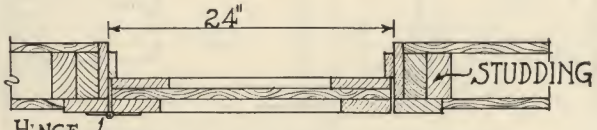


TROUGH SECTION FRONT VIEW of TROUGH

TROUGH & PEN ENCLOSURE

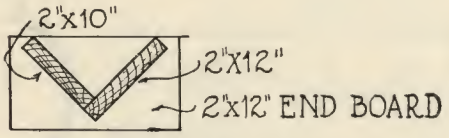


REMOVABLE PLANK FLOORS

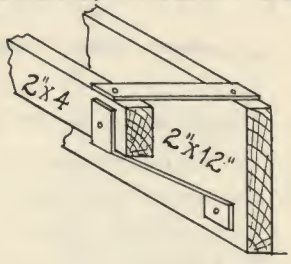


DETAIL of SMALL DOORS

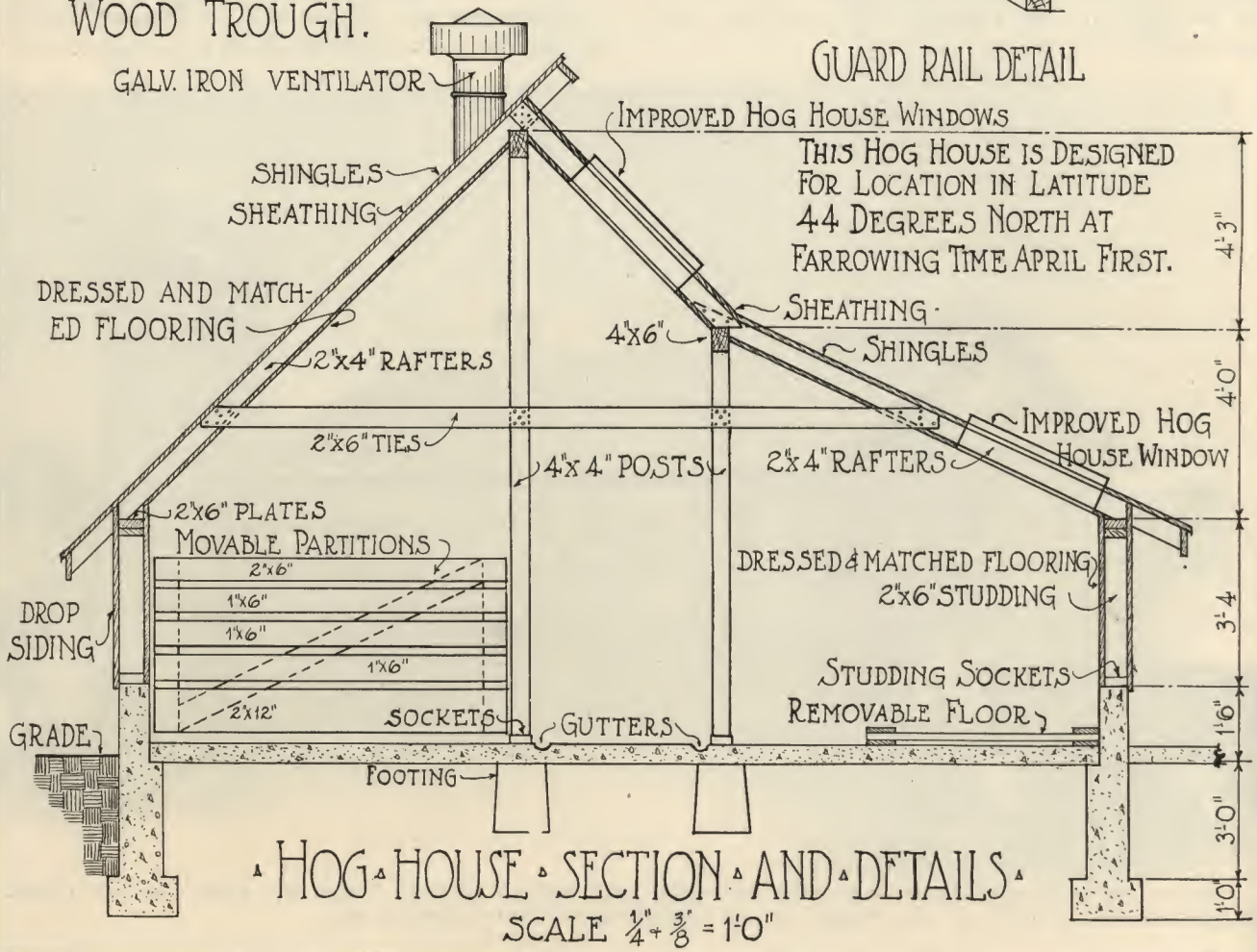
IMPROVED WINDOW DETAIL



WOOD TROUGH.



GUARD RAIL DETAIL



HOG HOUSE SECTION AND DETAILS

SCALE ¼" + ⅜" = 1'0"

Construction Details of Winter Hog House with Sunshine Windows, Design No. A302, Shown on Opposite Page.

frames, of which details are given.

Where such a great percentage of the building is constructed of clay and rock products it might be well to suggest the use of a wood floor covering to insulate the stock.

A barn built in this manner and of the materials shown should be thoroly ventilated, otherwise the moisture in the atmosphere will condense and collect on the interior surfaces of the walls.

A COMBINATION HOG HOUSE.

In this structure the architect calls for wood floors in the individual pens. The floors are movable and may be taken out and cleaned and aired. The floors are made of 2 by 4's, 5′ long, held in place with 1 by 4 cleats.

The studding for the building are 2 by 6, 6′ in length.

It would be good construction to use a 2 by 6 tie, 20′ long; in fact, the cross section calls for the use of one such tie, rather than one composed of several short pieces.

For the movable partitions 8′ lengths will be needed. Short lengths of 2 by 10 and 2 by 12 will be needed for the troughs, the length of which does not appear on the plans shown.

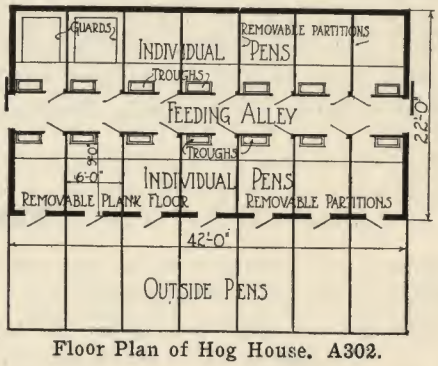
From a Practical Viewpoint.

A well-built hog house containing 14 individual pens, with an alley thru the center, is shown in the accompanying perspective and floor plan of Design No. A302.

The house is 22 feet wide and 42 feet long, with two main entrance doors at the ends of the feeding alley. Each stall on the south side of the building has an outside door to connect it with the outside exercising pens.

The foundation is of concrete, and there is a solid concrete floor the full size of the house. This floor is carefully made and given a smooth water-proof finish, so it may be kept clean with the least possible expenditure of labor. The concrete wall extends up eighteen inches above the grade line to prevent the possibility of a draft of cold air on the nests. All doors are carefully fitted to shut tight in the winter time.

Each pen has its individual feeding trough, also a swinging gate opening into the center alley. These



Floor Plan of Hog House. A302.

A Fourteen-Pen Winter Hog House, measuring 42 by 22 feet, of a modified saw-tooth roof design to use the roof windows, which are made with galvanized iron frames and sash. Design No. A302. We can furnish blueprinted working plans of this building to any desiring them for only $6.00 per set.

gates are convenient when transferring animals from one pen to another. They are also handy at breeding time, because the presence of the attendant inside of the pens is frequently necessary.

The construction above the concrete consists of studding, outside boarding, strong building paper and drop siding. So far as the sides are concerned, it is important that the work be well done.

The shape of the roof is intended to admit all the light and sunshine possible during the farrowing season. Special roof windows to let in the sun light are provided. These are made of galvanized iron and are inexpensive.

Metal ventilators are provided to carry off the foul air, which is a necessary precaution, because the health of breeding stock depends greatly upon the supply of fresh air.

Improved winter hog houses have helped to eliminate disease and to put the hog business on a better paying basis than ever before. The fact is now recognized that hogs require as careful handling in winter as other kinds of live stock. Hogs have been known to winter thru in poorly constructed buildings, but it pays to house and feed good breeding stock in a thoroly scientific manner.

If builders will interest themselves in the various buildings required by up-to-date farmers and will become thoroly conversant with their requirements, a large amount of building business will unquestionably be done.

Hay Feeding Racks for Hogs.

Hogs cannot eat hay out of mangers. If it is given to them on the ground they soon make bedding of it, so it seems necessary to build special racks for feeding hay to hogs.

After a number of experiments builders have hit on the plan of top hinging the sides of a rack so that the hogs can push them in at the bottom. The sides of the racks are made perpendicular or with a slight flare outward at the bottom, so the hay will slip down easily.

Two by two inch rounded spindles work the best in a hog feeding rack, and so placed as to leave openings about 5 inches apart in the clear.

CHAPTER XIX.

TYPES OF BUILDINGS

Lumbermen and contractors do not deal exclusively with any one class of customers nor are their efforts confined to any set type of buildings. Whether the demand be for a dollhouse, an implement shed, a cottage, a country home, a business structure or material for a gate, they must be of assistance in every possible way.

With a view to familiarizing the reader with various types of buildings a number are given consideration in this part of the book, special stress being laid on those features which should not be overlooked when making up a bill of materials.

Efficiency lumber yard shed favored by Iowa line yards.

A LUMBER SHED.

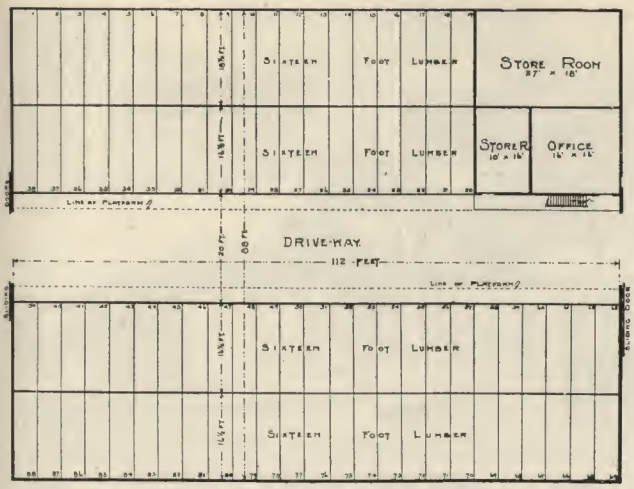
Shed plans always have been of especial interest to retail lumbermen. The ordinary shed entails a heavy investment and for that reason every phase and aspect of the plan should be taken into account before it is adopted or work is begun.

With the high prices of real estate the retail lumber dealer has been forced to economize in space. To store his stock with the least possible deterioration he has been forced to keep everything under the shed roof and thereby increase greatly the efficiency of retail yard management.

Line yard owners, as well as the independent dealer, are often puzzled over the problem of economical lumber shed construction. Many have failed utterly in the building of these structures. Trying to economize in materials and labor has given hundreds of lumber yard owners unsatisfactory sheds. Many are improperly braced and soon sag out of shape, while others cannot be filled to capacity for fear that the whole shed will collapse. Other sheds are planned without regard to convenience in storing the lumber or waiting on the customers.

Here are plans and details of a shed that has made good. It is being used by three different line yard lumber concerns operating thruout Iowa, Minnesota and the Dakotas. It has stood the test of time. Not a weak point can be found in the construction of the shed, which will house 176 lumber piles 4 feet wide and varying in height from 9 to 5 feet.

The cost records and the material list of this 88 by 112-foot double shed show that 17,370 feet of 2 by 4 and 16,100 feet of 2 by 6 dimension were needed for the framing of the building. Eleven thousand one hundred feet of sheathing and 3,200 feet of siding lumber, together with the roofing material make the material cost run up to the $1,600 mark. The cost of the labor for this size shed will amount to about $400, making the total cost of the building



PLAN OF LUMBER SHED.
Floor plan layout of efficiency lumber shed.

$2,000. Not a heavy timber can be found in the structure, nothing larger than 2 by 6 being used. The owners favor this type of construction in that every scrap a foot long can be used to an advantage in the planking together of the 2-inch material. As for strength, this design is favored over the more expensive timber frame method.

The outside bins of this double lumber shed are 16½ feet and 18½ feet in length, so that 16 and 18-foot stuff can be stored in them. However, since the bins are practically continuous, 20 or 24-foot material can be stored in the 18-foot side, provided that 10 or 12-foot stuff were piled on the 16-foot side along the center driveway. This shed will house all the stock of the average retailer, with the possible exception of a few long timbers.

There are eighty 4-foot bins on the first floor, which are 9 feet high. The outside bins are but one story in height, the second deck is full 16 feet in depth, with the third deck used for only light weight and short lumber. The platform on the second floor gives the yard man access to all the upstairs lumber piles. The store rooms near the office house the supplies of roofing materials and moulding that are found in every yard.

In the planking together of the 2-inch material, a number of 16 d spikes were used, so that they will not go thru. All the framework rests on concrete piers, as is indicated by the cross section drawing. Four by six planked sills and end posts are used, while 4 by 4 inside posts are used, being braced in every direction.

This shed has ever remained plumb and no signs of weakness have appeared in the eight years of actual service it has rendered its owners.

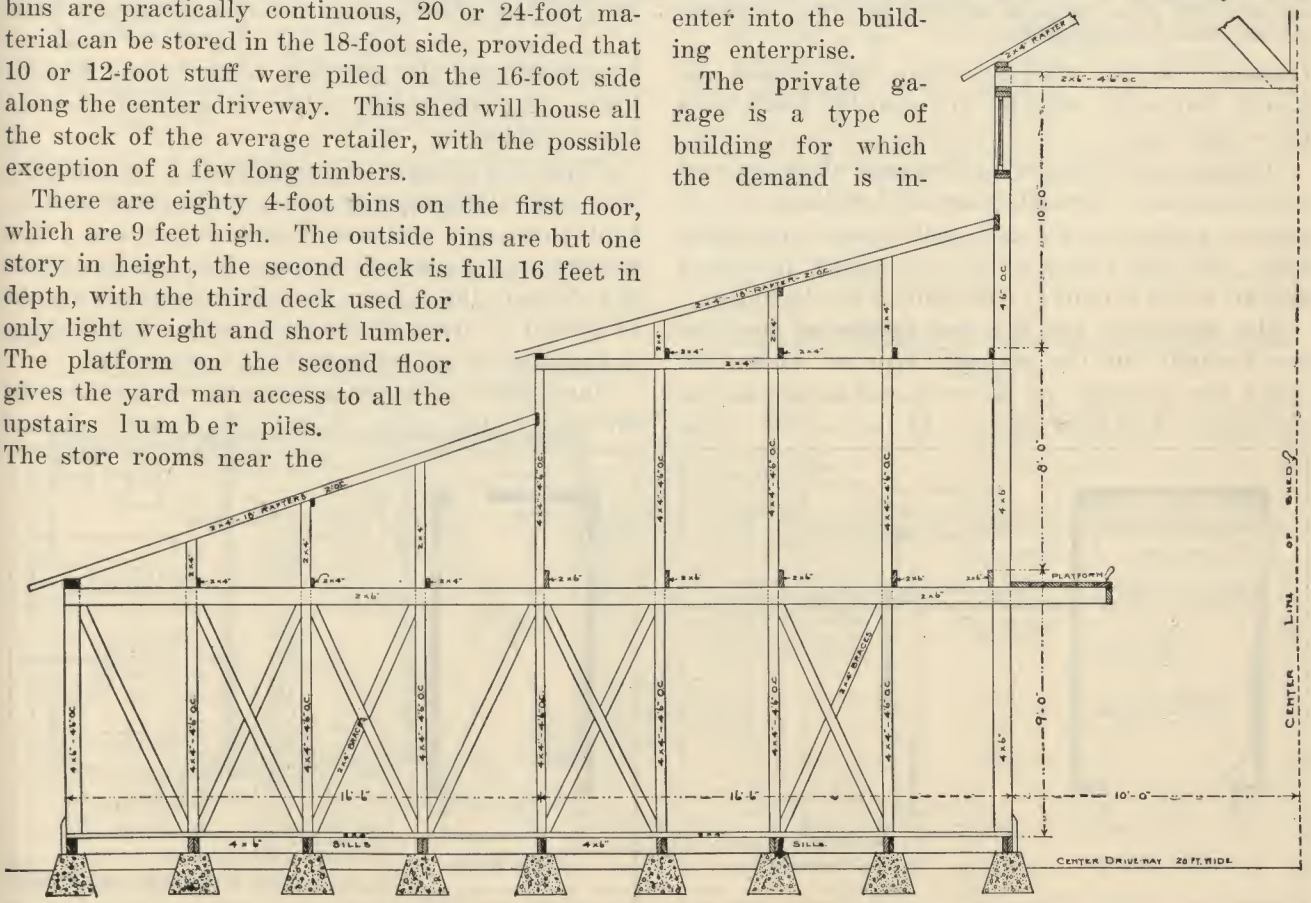
GARAGE BUILDING.

Far too many garages seemingly are built on the theory that anything that will turn water will do. But anything will not do, and many of the flimsy structures are being torn down and are giving place to common sense homes for the family car.

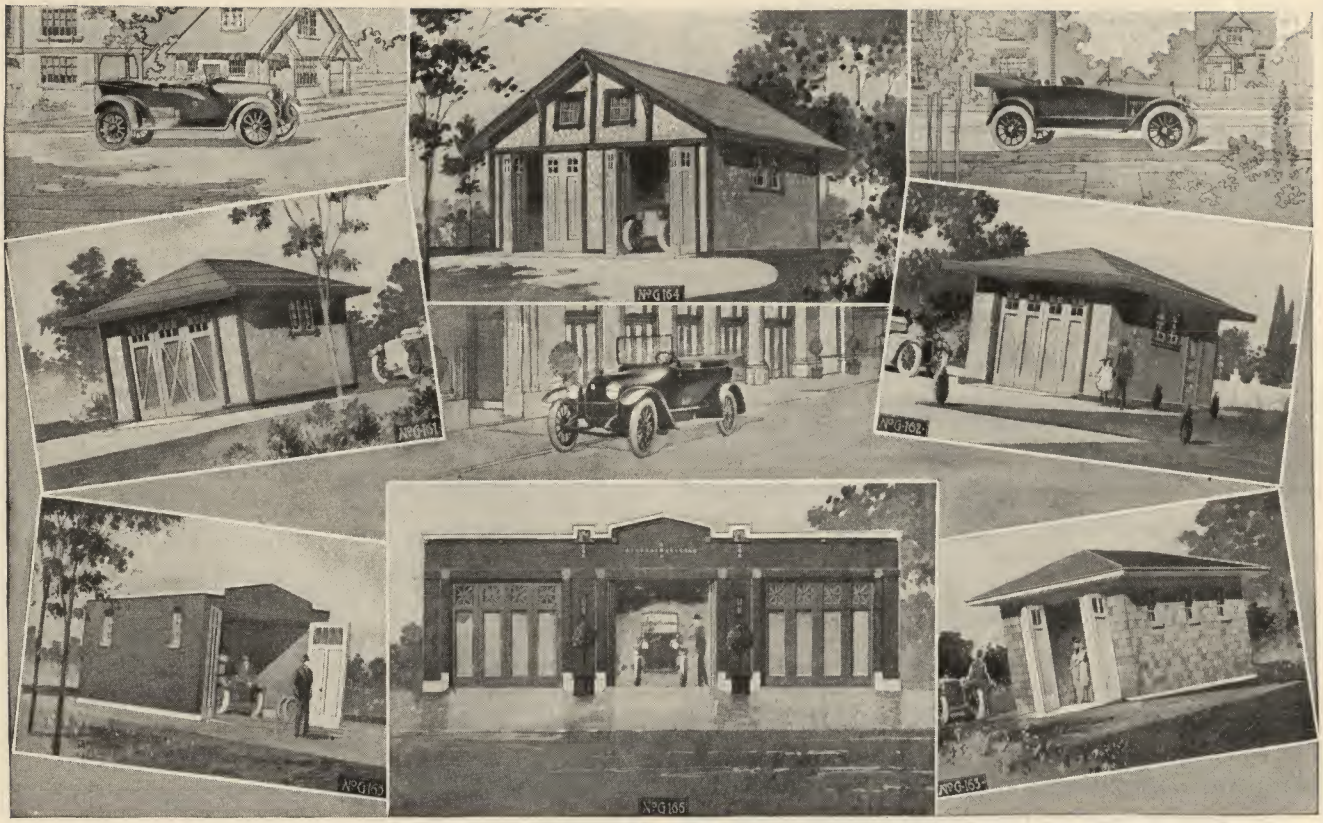
A garage should set high enough to keep out the water; it should be well lighted; it should be large enough to permit the caretaker to get at every part of the car; a pit should be provided; there should be room for a workbench; and, in these days of the all-year-round service demanded of an automobile, it should be possible to heat the building in which it is stored.

Such a building can be provided at a reasonable cost, but real thought as well as real money must enter into the building enterprise.

The private garage is a type of building for which the demand is in-



FRAMING DETAILS AS SHOWN IN CROSS SECTION OF LUMBER SHED.
Details of construction of efficiency lumber shed.



Six clever little garages; to the left No. G161 and No. G165 are one-car garages of cement plaster and brick respectively; in the middle above is No. G164, a two-car garage, while below is No. G166, planned for three cars; at the right No. G162 and No. G163, the one of stucco, the other of concrete blocks or structural tile, are each for one car only. Compare with accompanying plans and detail drawings for further particulars. Price of plans of any one of the one-car garages only $4.00, two-car $5.00, three-car $6.00.

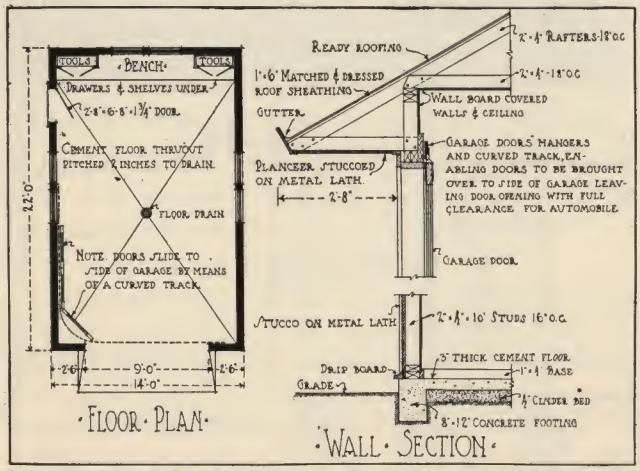
creasing. A few years ago they were almost unknown, but today both the city and the small town have their share.

Garages now are an attractive part of the general building plan. Several types of buildings to suit various makes of cars and pocketbooks are shown here. In new homes architects usually include a garage, and it is built to harmonize with the house.

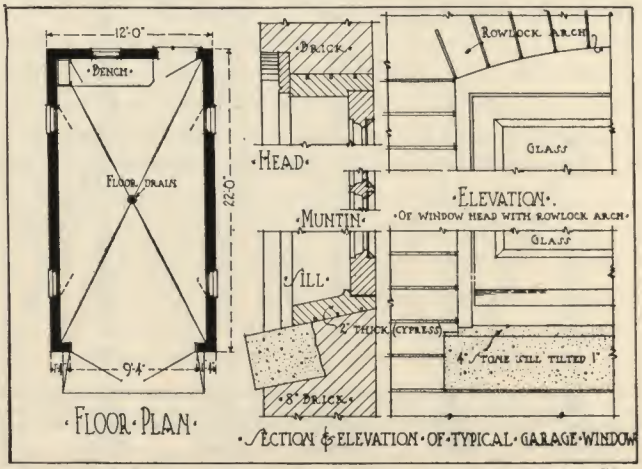
The advent of the flat and apartment building has brought out the multiple type of garage, of which two examples are shown in the accompanying perspective and floor plans. As the double house, apartment, and flat building move to the smaller towns, the double and triple garage will become more common.

Floors for garages are usually made of concrete. It is easily laid and presents a surface that can be kept clean and will not become oil soaked. The concrete can be laid to a slope from all directions to a drain in the center. A cement approach should be placed in front of the door with a slight slope so that the car can go in without a severe jar.

Many different materials are used with success in the construction of the walls. Three different ma-



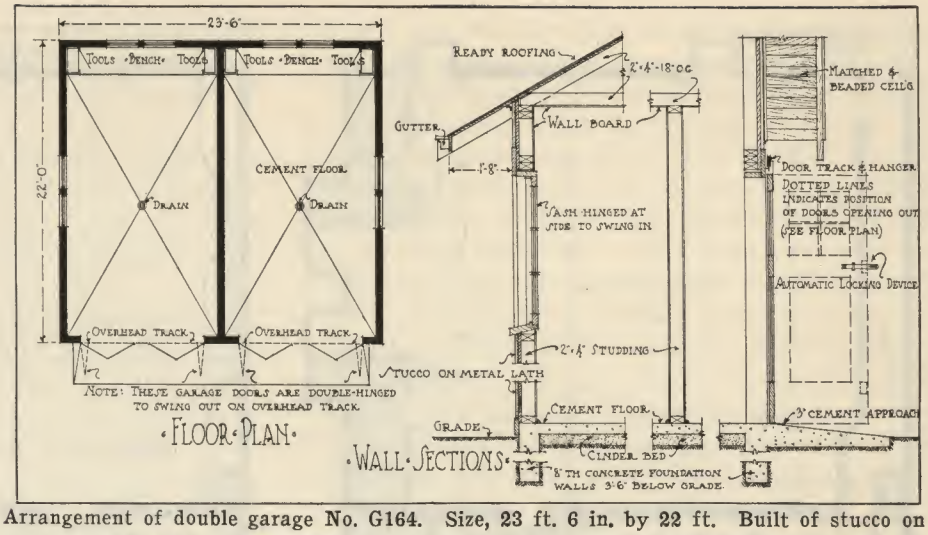
Floor plan and detail of garage No. G161. Size, 14 by 22 ft. Built of stucco on metal lath. Door is hung in three sections to slide back around corner on curved track.



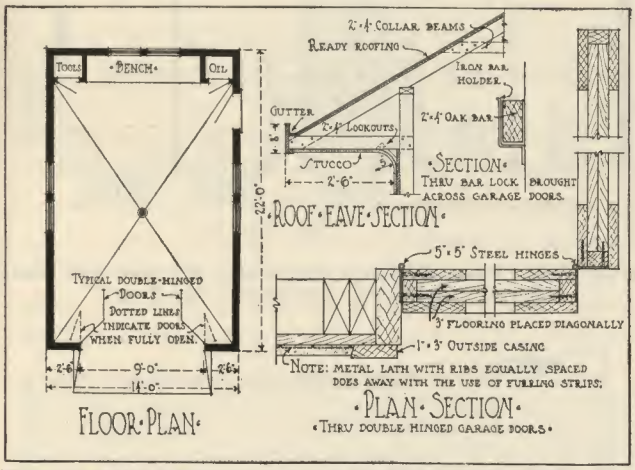
Details and floor arrangement of brick garage No. G165. Size, 12 by 22 ft. Door is 9 ft. 4 in. wide and is of the simple double type hinged to swing outward.

terials are shown in these plans. Stucco on metal lath, brick, and concrete block or structural tile are suggested for the garages illustrated here. These materials are particularly useful for garage building because they are fire resisting.

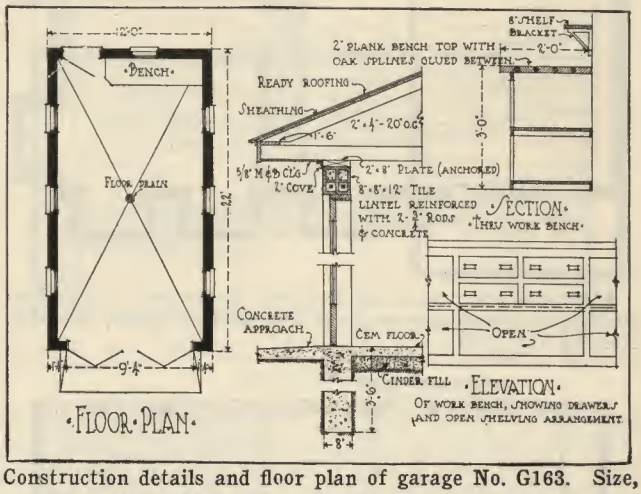
After having waded through house and farm buildings and detailed drawings the man who takes off a bill of materials for one of the garages here shown will find it "easy picking." In none of these plans is there a call for heating facilities or arrangements.



Arrangement of double garage No. G164. Size, 23 ft. 6 in. by 22 ft. Built of stucco on metal lath. Doors are double-hinged to fold outward and running on overhead track.



Floor plan and construction features of garage No. G162. Size, 14 by 22 ft. Doors are double-hinged to swing inward, no track.



Construction details and floor plan of garage No. G163. Size, 12 by 22 ft. Made of concrete blocks or structural tile. Doors are double-hinged, outward-swinging.

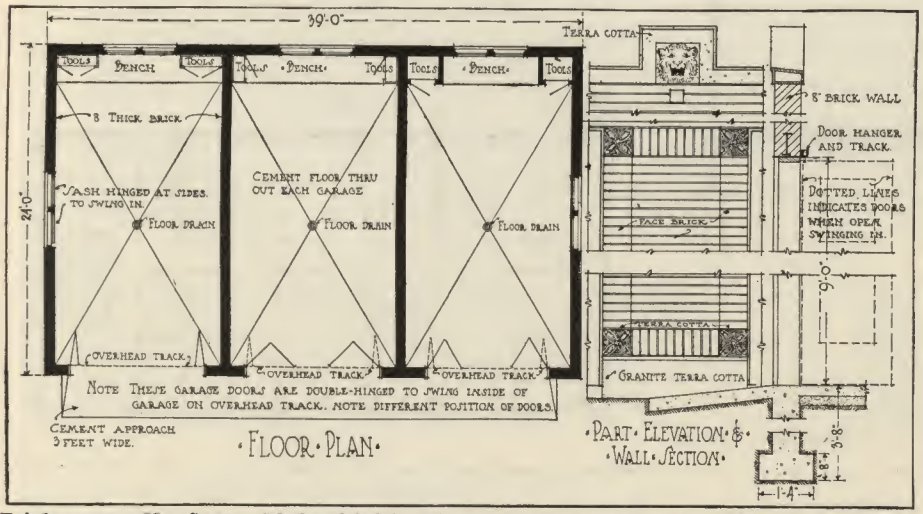
The building in which a car used in winter is stored should be heated to prevent the radiator from freezing and bursting.

The automobile has evoluted from a plaything to a necessary adjunct of society and commerce. If it shall perform its function it must be given adequate protection.

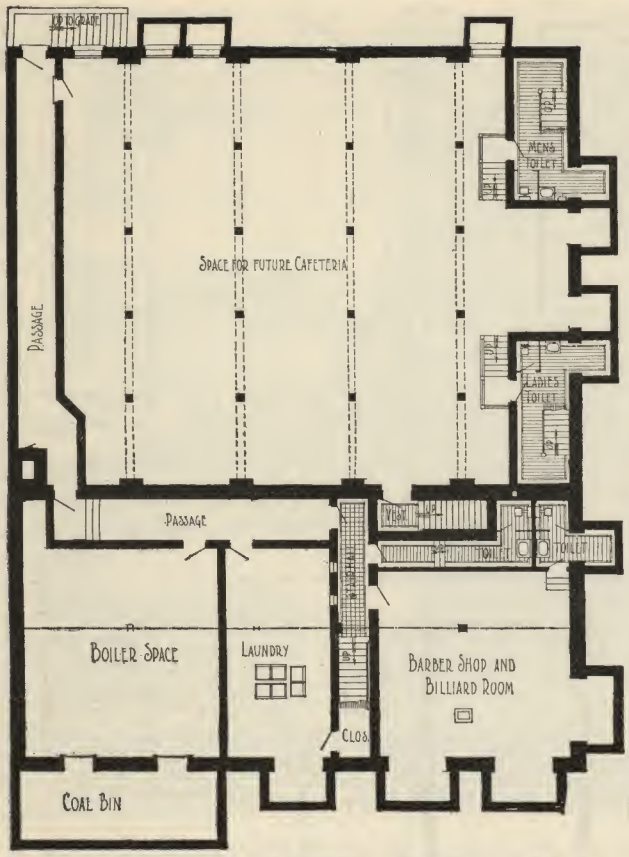
PICTURE THEATER BLOCK, STORES AND FLATS.

Every seat in a motion picture theater should be placed so that occupant will have an unobstructed view of the screen. The floor of the building, therefore, must slope so the occupants of one row of seats will not obstruct the view of those in the seats immediately behind.

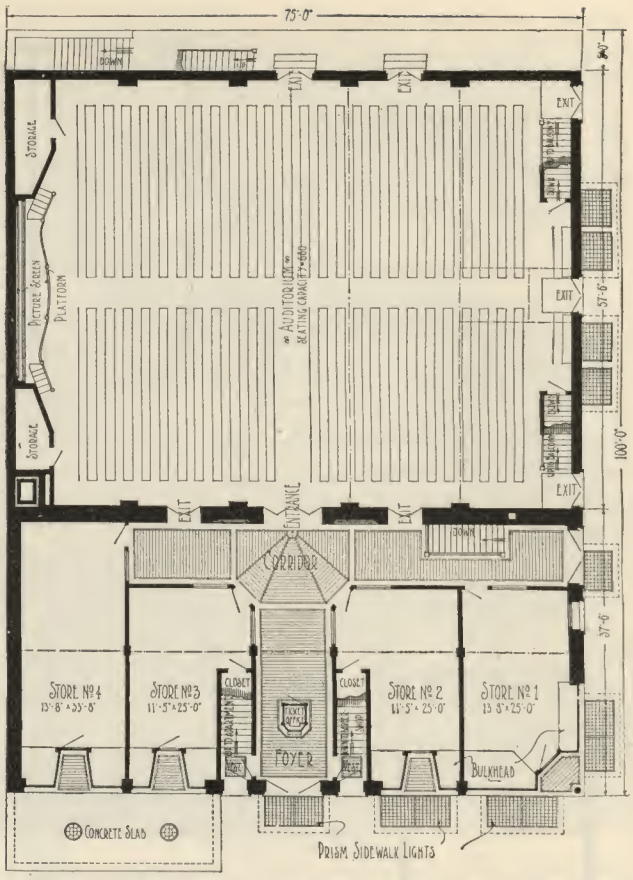
The "movies" are here to stay. A building constructed especially for this purpose or remodeled to meet the needs of the theater is suitable for no other use.



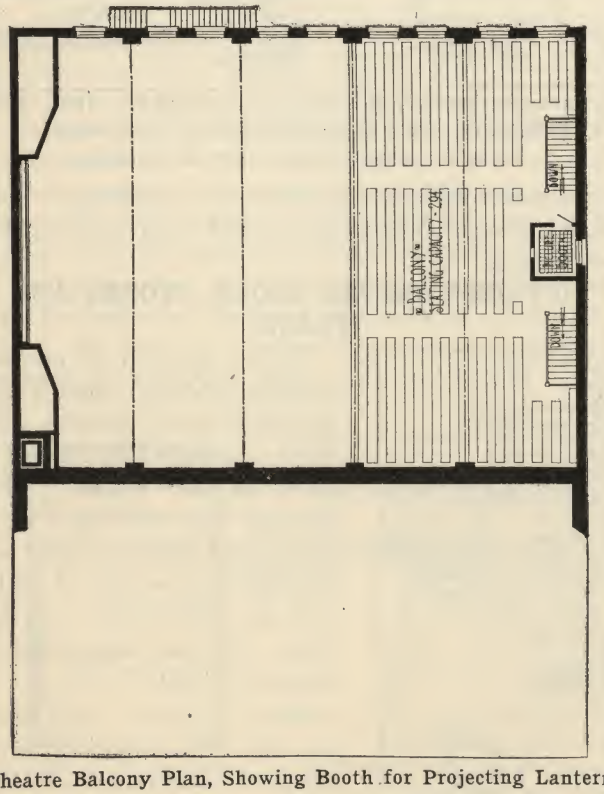
Triple garage No. G166. Made of brick, trimmed with terra cotta. Size, 39 by 24 ft. All doors are double-hinged to swing inward and hung from overhead track. Different positions of doors are shown.



Basement Floor Plan of Building, Providing Cafeteria or Restaurant Space, Barber Shop and Billiard Room, Laundry, Heating Plant, Etc.



Main Floor Plan, Showing Auditorium at Rear and Four Stores and Theatre Entrance at the Front.



Theatre Balcony Plan, Showing Booth for Projecting Lantern.

Second Floor Plan, Showing Arrangement of Six Small Apartments or Office Suites.

Floor Plans of Picture Theatre Block with Stores, Design No. 6853, Illustrated on the Opposite Page.

In many of the smaller towns where land values are not high the theater occupies a separate building, and the total income from the investment must be derived from this one source.

On a slightly larger lot it is possible to put up a structure of which the theater is only a feature. Such a building is shown here, with a section thru the theater and floor plans showing revenue producing stores, apartments and offices.

It is well to bear the central and dominating feature of this building in mind when the idea of building a theater for this purpose comes up for action.

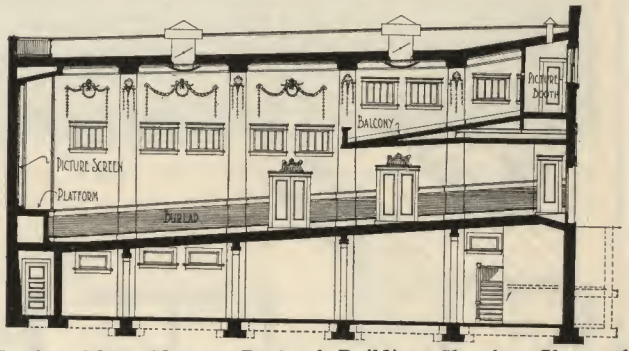
A SMALL TOWN BANK BUILDING.

The most decorative building in a town is generally the bank building. It depends perhaps more than any other business on handsome surroundings to attract people and give them confidence. In almost all other branches of modern business it is possible to compete with a man who has a much better building than your own. You can do this in various ways. Handling a better line of goods or displaying it more advantageously will often cause people to come into your place of business just to look around. Then by proper salesmanship you can get them to come again, and sooner or later you land them. You can also secure the good will and trade of people by offering service of a better grade than your competitor. If you are in a mercantile business you can specialize in quick deliveries, discounts for cash, credit arrangements, etc.

None of these opportunities are possible for a bank on the scale that they are for any other type of business. A bank can offer a few special inducements to depositors, but they are not dealing with a commodity that admits of the special arrangements such as other businesses. They have to depend on appearance more than anyone else. An old bank in a town may keep its business because everybody knows the cashier or the president and has confidence in them. The new bank, to compete with them, has to offer mighty attractive appearances so that people will like to go into their building. They cannot offer any particular advantages as a general rule that the other bank cannot offer also.

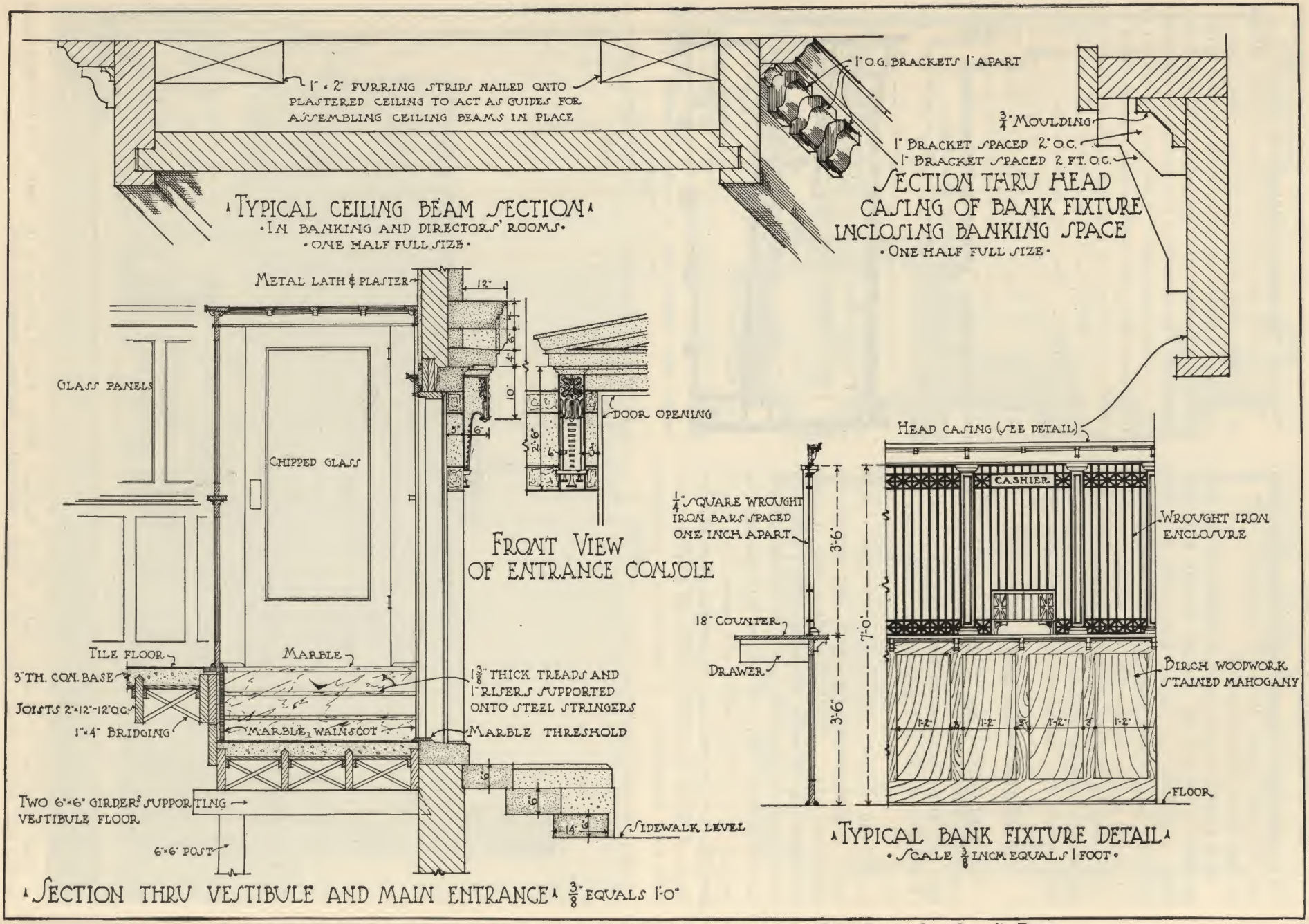
Bank Building Essentials.

It isn't very often that you see a bank that has



Section Thru Theatre Part of Building Showing Slope of Floor and Balcony.

Front Elevation of Modern Moving Picture Business Block. Theatre entrance at the center, with two large stores on each side. Living rooms or offices above. Large auditorium at the rear. Design No. 6853.



Details of Interior Construction and Finish for Small Bank Building (Design No. 6748), Illustrated on Opposite Page.

Perspective sketch of very attractive small bank building, constructed of brick and terra cotta. Dimensions, 25 by 54 feet. Design No. 6748.

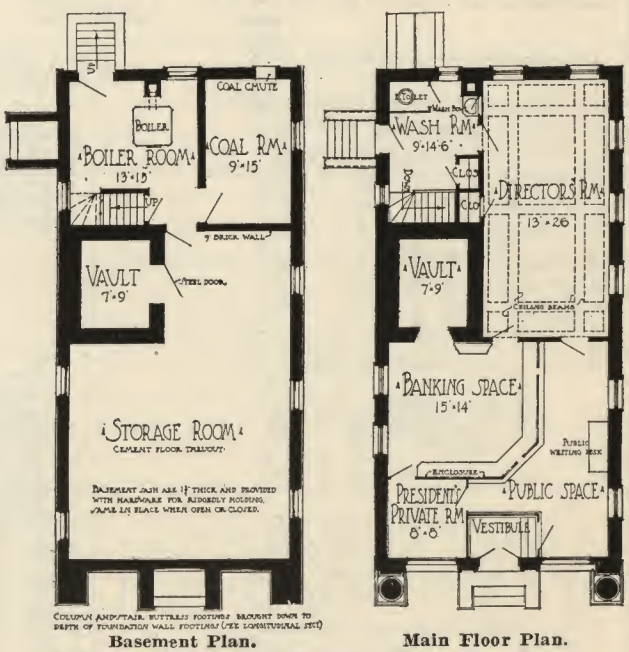
been established in some made-over building. The construction has to be of such a nature that very few buildings can be arranged as banks. Very heavy foundations, walls, and floors are required so that safes and vaults will be protected to a large degree. There are, of course, exceptions to every rule, and some buildings have been built over so as to make very good bank buildings. Nearly always, however, the bank builds its own building as it is necessary for appearance sake as well as for the sake of strength and safety.

As shown in the accompanying details, the walls are made very heavy, as are the foundations and the floors. Also the vault that should be built cannot be located very well in old buildings, but must be included in the plans as it is in this instance. The walls of this must of course be made very heavy, so that it will be fireproof as well as burglar proof. The heavy construction features of the building make it necessary to have heavy foundations so that they may be well supported. The floor is made strong because of the many people that may be on it at one time, and so it can support small portable safes such as are used in all banks.

Nearly every town has a bank, and the builder who has good, practical ideas on their construction will often get a chance to do this work. If a local man can handle this kind of work, it will not be necessary to import a firm from some other location. Even if a man does not get the contract, he can get a certain part, such as the interior trim, etc.

Bank Building Details.

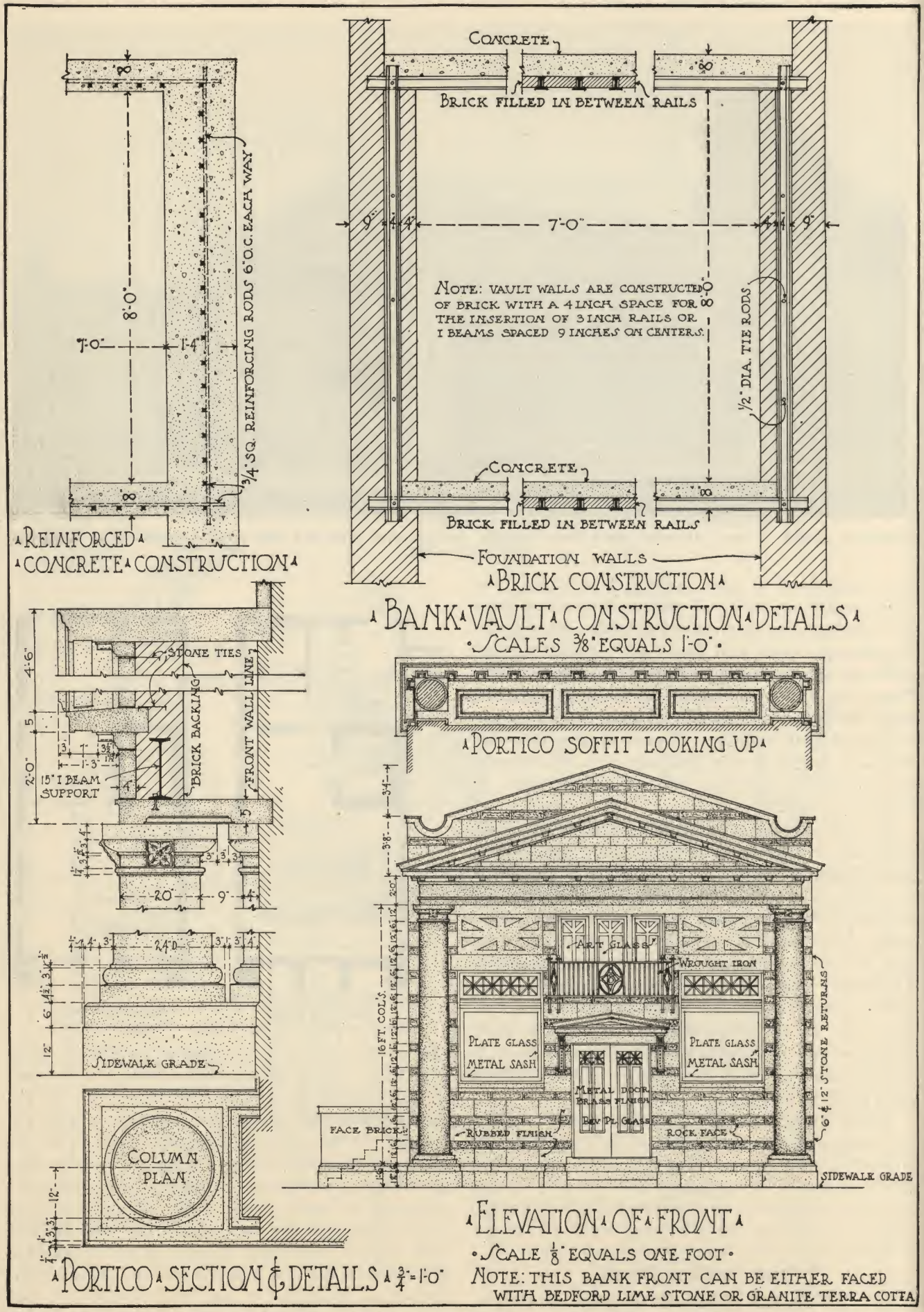
The longitudinal section shows many of the details of construction of this building and gives an



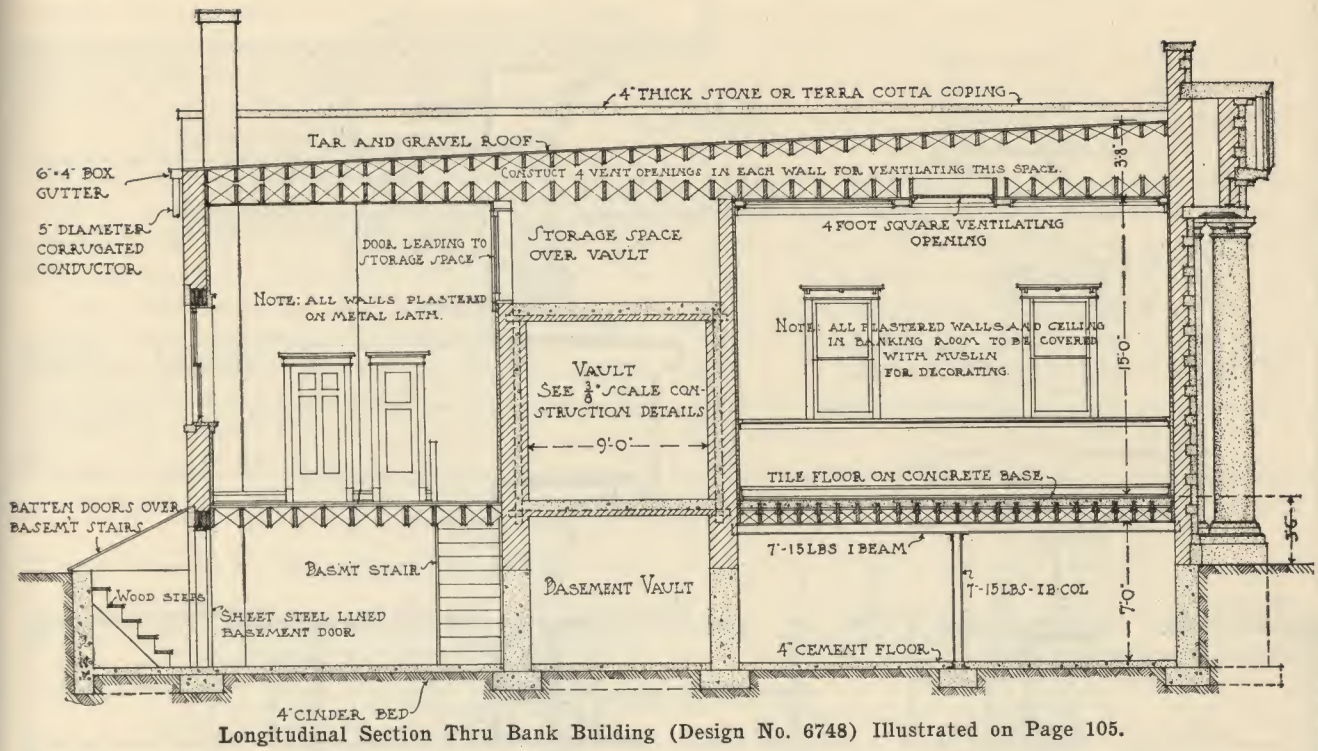
Basement Plan. **Main Floor Plan.**

Size of building, 25 by 54 feet. (Design No. 6748.)

idea of the class of work required for smaller bank buildings. One of the special features is the method of building the floor under the front part of the bank, where the public and banking spaces are located. It also shows the massive character of the walls and the foundations that are necessary to support them. Attention is called to the walls surrounding the vault, particularly. The size of these is also shown in the floor plan. The roof is built with a slant from front to back, so an air space is left between the roof and the ceiling. This is ventilated, as mentioned on the cross section, by four openings in each of the walls.



Details of Bank Front; also Details of Two Methods of Construction for Fireproof Vault (Design No. 6748, Illustrated on Page 105).



Longitudinal Section Thru Bank Building (Design No. 6748) Illustrated on Page 105.

The floor plan shows the general arrangement of the rooms on both the main floor and the basement. In the basement there are located the storage room, coal room, boiler room, and the basement vault. The entrance to the main floor is into a vestibule which opens to the right into the public space. The opposite front corner is occupied by the president's private room. The banking space is directly back of this room. The vault, the directors' room, and a wash room are located in the back part of the building.

The larger detail sheets show some of the various smaller construction features of the building. One of the sheets shows the construction details of the vault and also an elevation of the front which illustrates the many various little features that are used in making decorative fronts in bank buildings.

SMALL TOWN STORE OR "RENT PAYER."

In the large cities one story structures suitable for business purposes frequently are built on choice property and designated as "rent payers." The business needs of the locality are difficult to foresee, hence the one story building on ground that is far too valuable to be used in that way. The income for a decade—if left standing for that length of time, usually is sufficient to pay the carrying charges.

In small towns the one story business structure usually is permanent. Sometimes the foundation and first story walls are constructed to carry one or more additional stories, should a demand arise for the space. Usually the one story business building is complete in itself as it leaves the hands of the builder.

Value of Beauty.

It does not add greatly to the cost of such structures to include a touch of beauty or distinction. The severely plain facade may be relieved by a judicious use of brick, stone and glass.

In getting away from the handicap of too few lines the builder should not make the greater mistake of too many. An artistic design for a building of this character is shown. This method of construction is known as the "Maximum Daylight Store Front," light being deflected inward by the prism glass transoms.

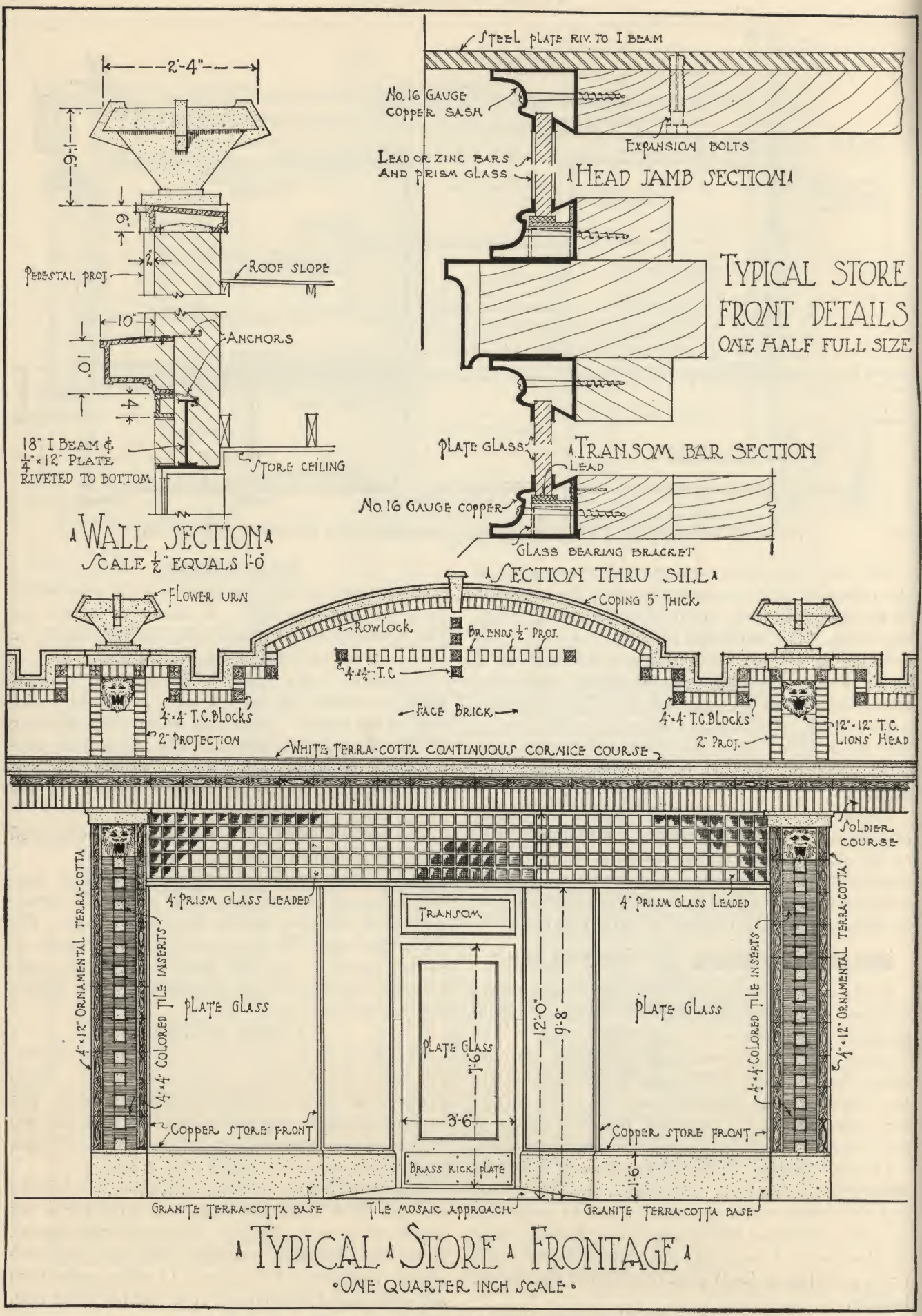
The wall is built of face brick with enameled white terra cotta trim.

This design could be modified to produce four stores instead of five and such change is recommended if the plan is used in a small town. For the larger cities the five-store building probably is to be preferred. In such cases if one is not sufficient the business usually is large enough to justify the use of two rooms.

A Study in Detail.

The detail of the several stores given in connection herewith should be studied with care. Ordinarily plans for a store do not include fixtures. The fixtures shown in the detailed drawings merely are typical of the character of fixtures ordinarily employed in business structures of this class.

There is a radical difference between the shelving and cases for a grocery store and those for a dry goods store, as a study of the detail will reveal. Sometimes fixtures, including shelving, are purchased ready to set in place. In other cases both are supplied by the contractor or local planing mill.



Details of Store Front Construction for Design No. 6760 as Illustrated on Opposite Page.

When fixture details are made a part of a plan it is correct to assume that they are to be supplied unless specification expressly relieve the material man or the contractor of the burden.

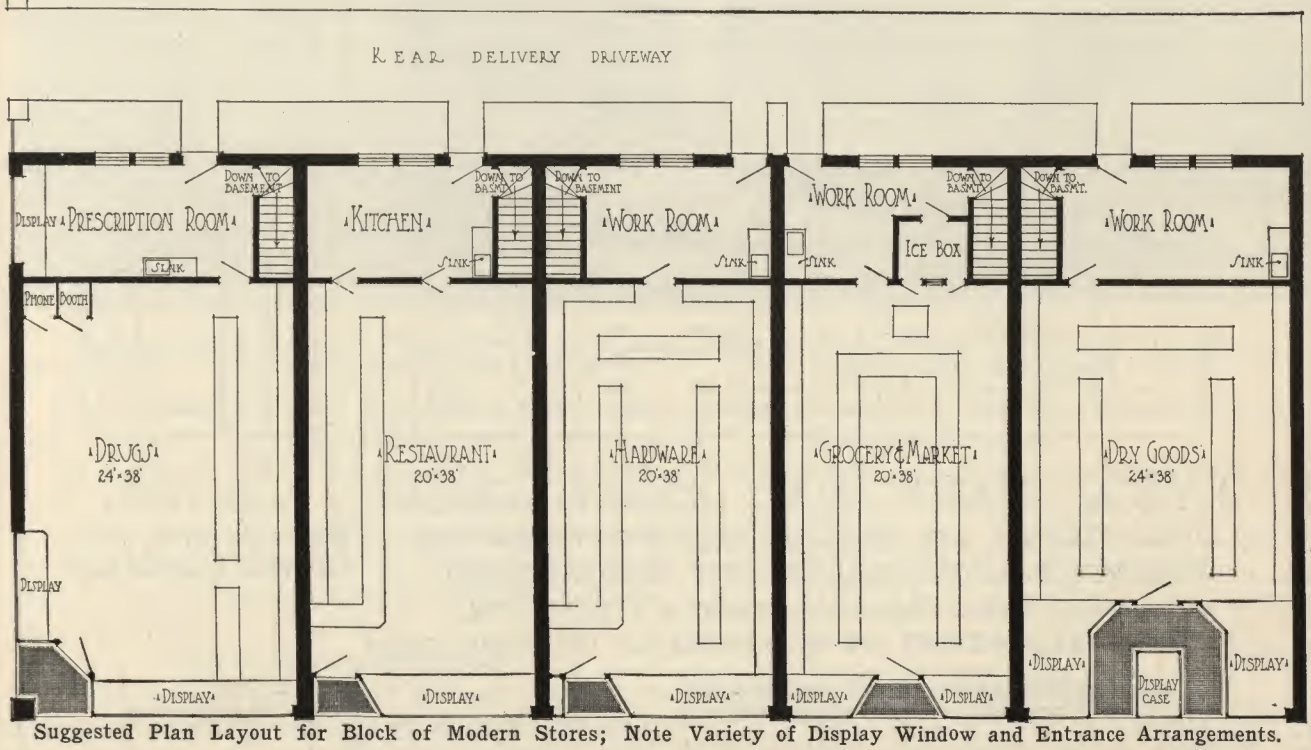
A HOME FOR SIX FAMILIES.

In the large cities the detached house is the exception. Homes for the people are provided in groups, including hotels, apartment buildings, flats and tenements.

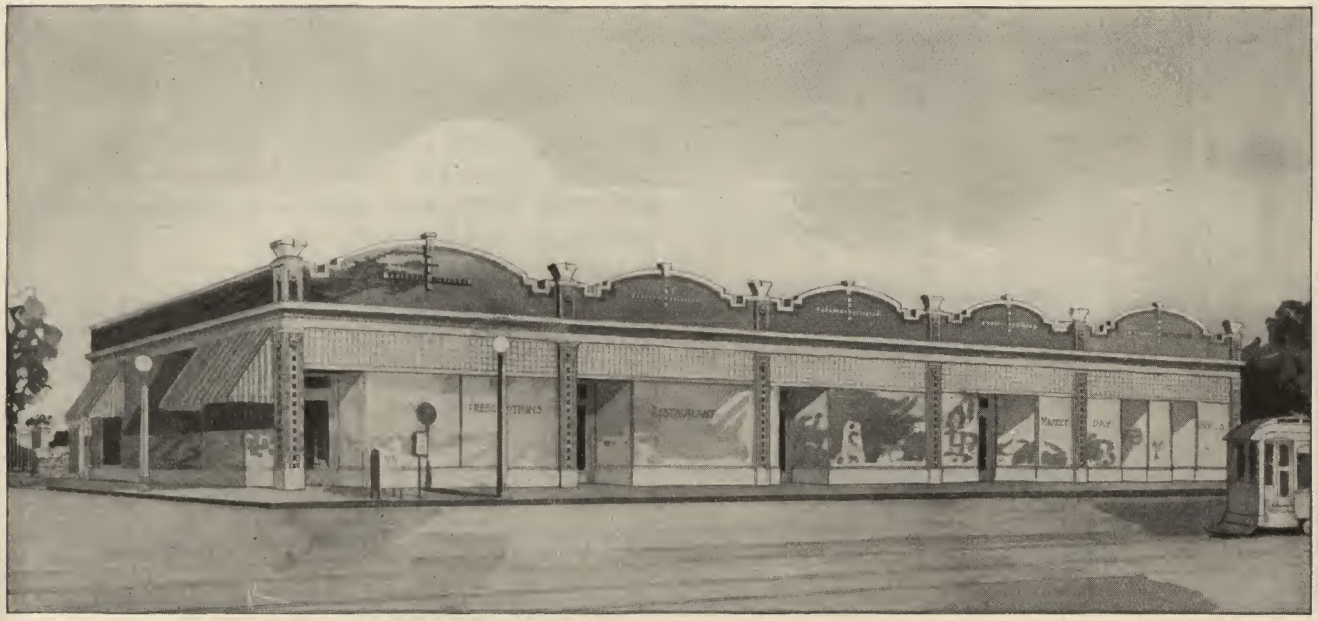
Two, three, four and six family structures are making their appearance in many of the smaller cities and villages. Humanity appears to take kindly to the idea of crowding together, seemingly content to multiply certain of its woes in return for the privilege of dividing some of its responsibilities.

In this "home for six families" building there is much of interest to be noted by owner, prospective tenant, material man and contractor.

This is a substantial brick building having three five-room apartments on the first floor and three six-room apartments on the second is shown in this design. It is of the well known Philadelphia type, and gives the appearance of quiet elegance. Its plain, simple lines and heavy construction add to the impression it gives of being dependable and comfortable. Such a building is ideal as a real estate proposition.

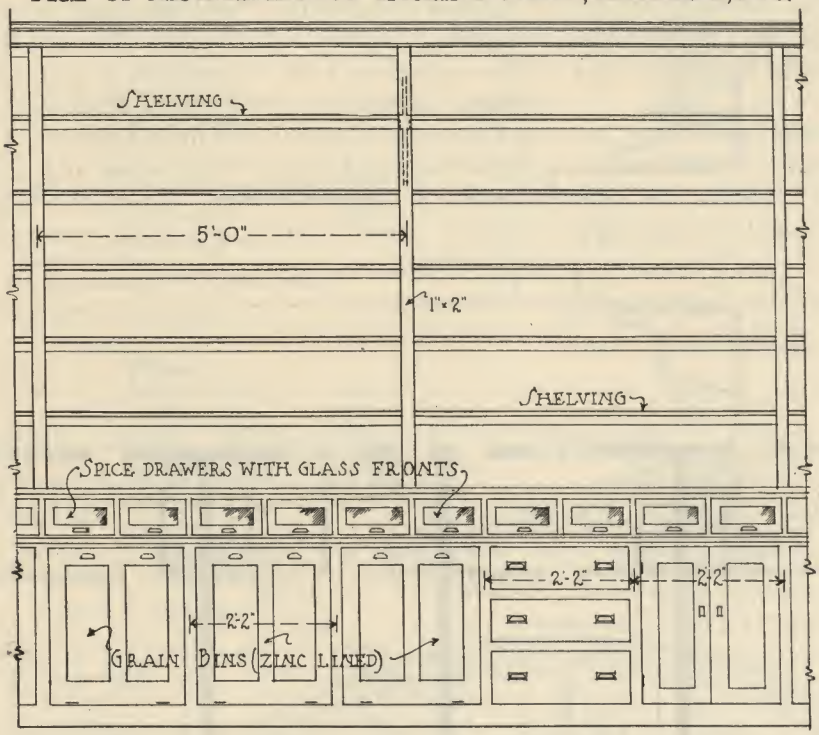


Suggested Plan Layout for Block of Modern Stores; Note Variety of Display Window and Entrance Arrangements.



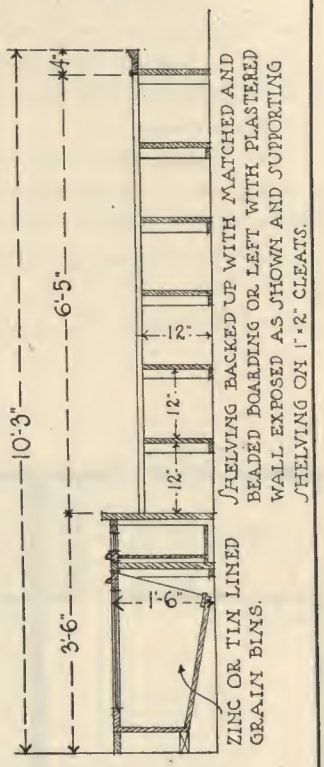
Block of Five One-Story Stores to occupy a corner lot, size 114 by 50 feet; maximum daylight store front construction with prism glass transoms. White enamel terra cotta trim. Design No. 6760.

NOTE: A SPACE OF ABOUT 2 FEET IS NESESSARY BETWEEN CASE TOP AND CEILING FOR THE STORAGE OF MISCELLANEOUS PACKING BOXES, PLACARDS, ETC.



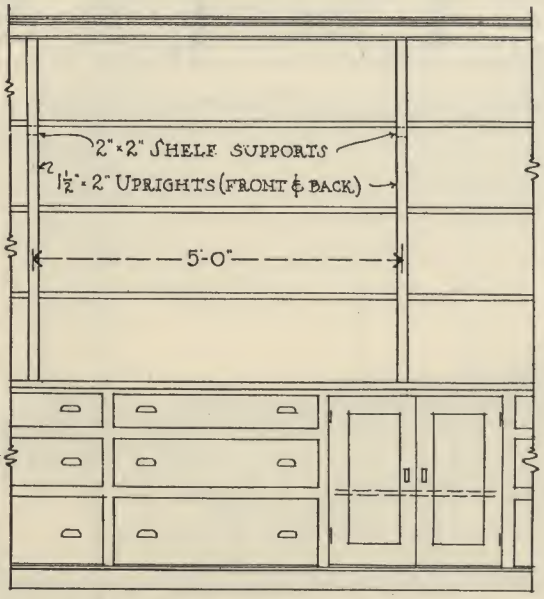
TYPICAL GROCERY STORE SHELVING & CASES

STORE FIXTURES ARE COMMONLY BUILT-UP OF YELLOW PINE (VARNISHED OR PAINTED), OAK (VARNISHED) OR BIRCH (STAINED MAHOGANY). THESE DRAWINGS SUGGEST A TYPICAL STORE FIXTURE ARRANGEMENT FOR GROCERY & RETAIL DRY GOODS STORES.

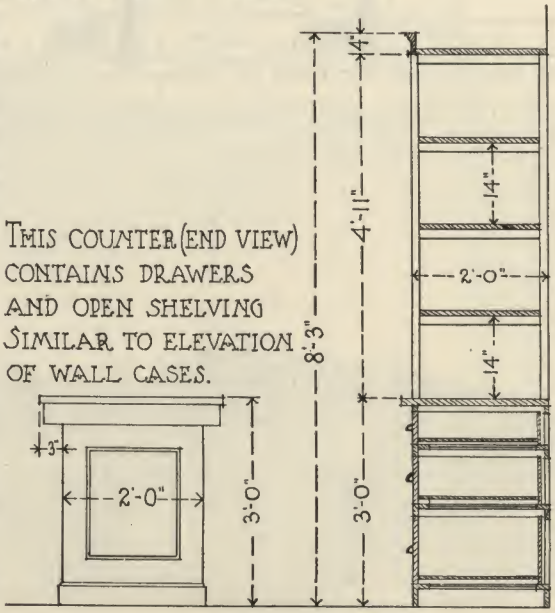


SECTION

THRU SHELVING, SPICE DRAWERS & GRAIN BINS.



THIS COUNTER (END VIEW) CONTAINS DRAWERS AND OPEN SHELVING SIMILAR TO ELEVATION OF WALL CASES.



TYPICAL DRY GOODS STORE SHELVING, COUNTER & CASES

SCALE ⅜ INCH EQUALS ONE FOOT

SECTION

THRU SHELVES & DRAWERS

Details of Grocery Store and Dry Goods Store Fixtures to Accompany Modern Store Design No. 6760, Illustrated on Page 109.

Six-Flat Building of Modern Design. Size 83 by 46 feet. Design No. 6704. We can furnish blueprinted working plans of this building to any desiring them for only $12.00 per set.

The flats on the ground floor have a small vestibule that opens into a large living room. There is a cased opening from this room to the dining room. The kitchen is behind the dining room and there are two bedrooms, one opposite the dining room and one opposite the kitchen. The bathroom is located between the two bedrooms, which is the best arrangement possible.

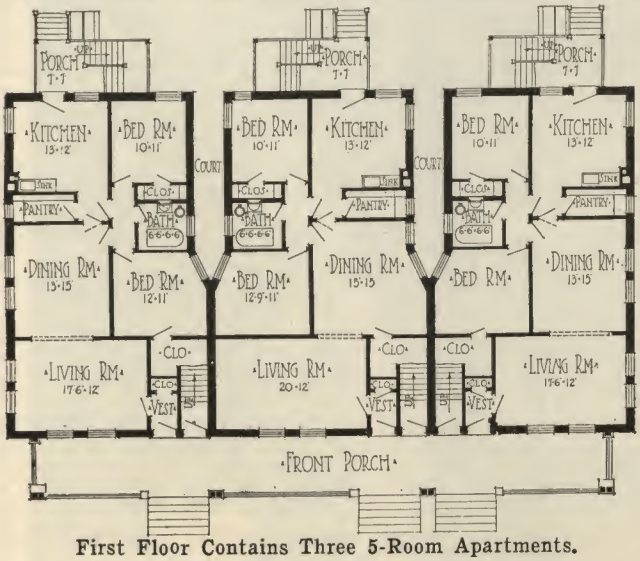
Second Floor Arrangement.

In the second story, the arrangement is much the same, except that another room is added by using for a bedroom the space that was occupied downstairs for the vestibule and the entrance to the upper flat. This makes the living room slightly smaller, but it is still a good sized room. The rest of the arrangement is much the same—with two bedrooms, a dining room, and a kitchen.

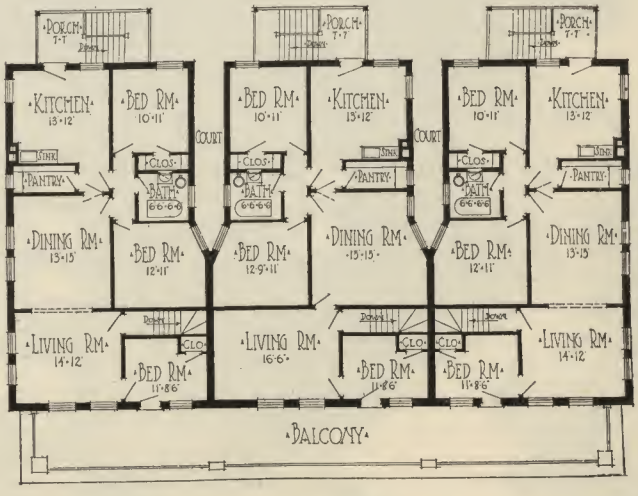
All the flats on both the first and second floors are well lighted. There are many windows on all the outside walls, as can be seen from the illustration. The lighting of the inside rooms is taken care of by two courts, which are cut into the building from the rear. These extend from the back of the building about half way to the front.

The porch and balcony have a very stately appearance from the outside and are arranged with the idea of being roomy and convenient.

The exterior finish is of face brick with white stone or terra cotta trim.



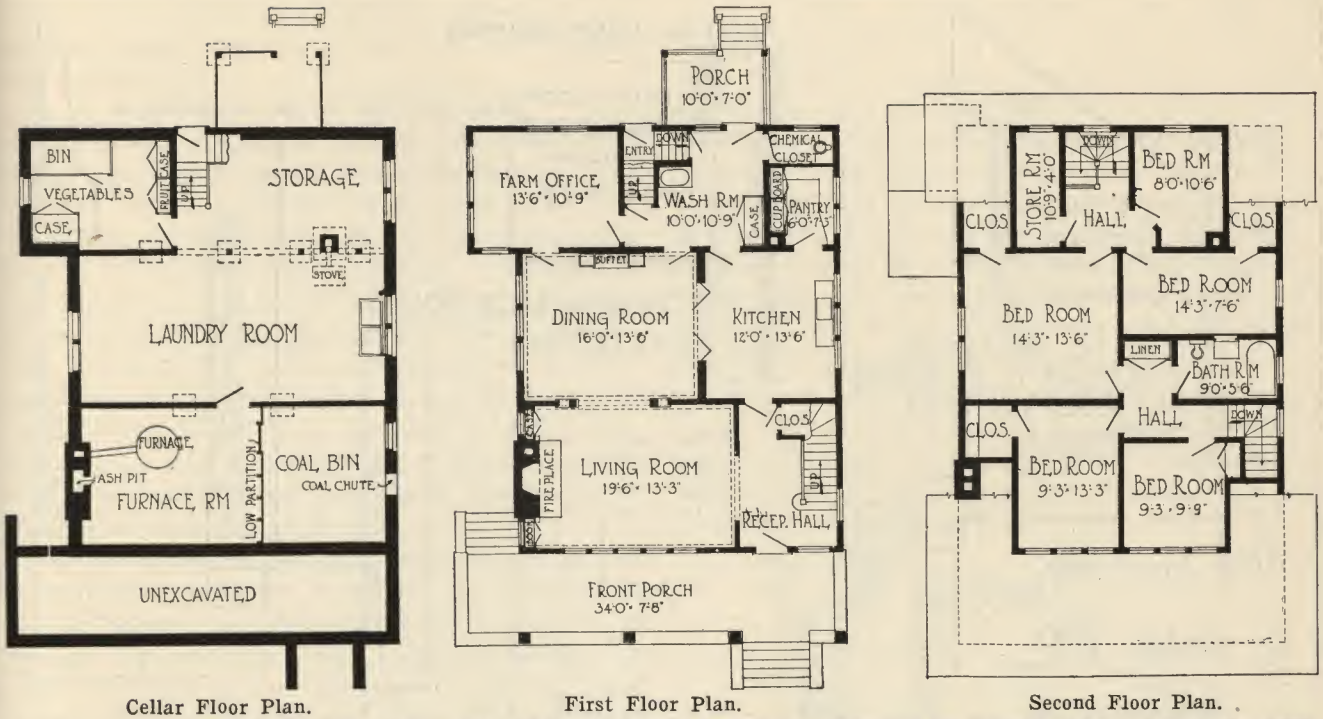
First Floor Contains Three 5-Room Apartments.



Second Floor Contains Three 6-Room Apartments.

Arrangement of Six-Flat Building. Design No. 6704.

Photographic Architectural View of Model Farm House Designed Along the Latest Bungalow Lines, and Containing Those Special Features of Interior Arrangement that a Real Farm House Requires. For Floor Plans and Interior Details, See Pages 113 and 114, Design No. 6772. We can furnish blueprinted working plans of this building to any desiring them for only $6.00 per set.



Cellar Floor Plan. First Floor Plan. Second Floor Plan.

Arrangements of Nine-Room Farm House, Size 30 by 39 Feet 6 Inches, as Illustrated on Opposite Page. Design No. 6772.

FARM HOUSE OF BUNGALOW DESIGN.

The great advantage of the room arrangement shown in this model farmhouse lies in the fact that the living quarters and living rooms of the family are separated from the rooms that are used by the hired help. This arrangement applies both to the first and second floors. This idea was recently brought into prominence by the Minnesota State contest for prize farmhouse designs. Each design had to incorporate this arrangement in some way.

From the back porch the entrance leads to a wash room where the men coming in from their work can clean up, without going into the kitchen and interfering with the cooking. It is not necessary for the men to go into the kitchen at all, as they can go directly into the dining room from the wash room. A case is provided in which the man can hang their outside work clothes.

Two bedrooms are provided for the help on the second floor. These can be shut off from the rest of the upstairs by closing one door in the large bedroom that leads to the back hall. The family occupy the other three rooms on this floor and reach them by the front stairs, while the back rooms are reached by the back stairs.

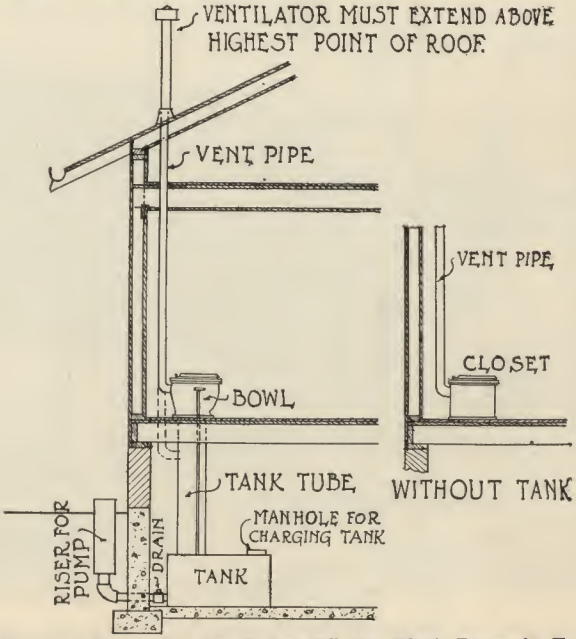
The Farmer's Office.

On the first floor one of the back corners of the house is fitted up as a farm office—the farmer's private room for the transaction of the farm business. In these days of scientific farming, the guessing system is as useless as it would be in any other kind of business. There must be filing systems and records that are kept on costs and all the various other details of a business. The farm office is located so that the owner or manager can see all the buildings from this room thru the windows on the three sides.

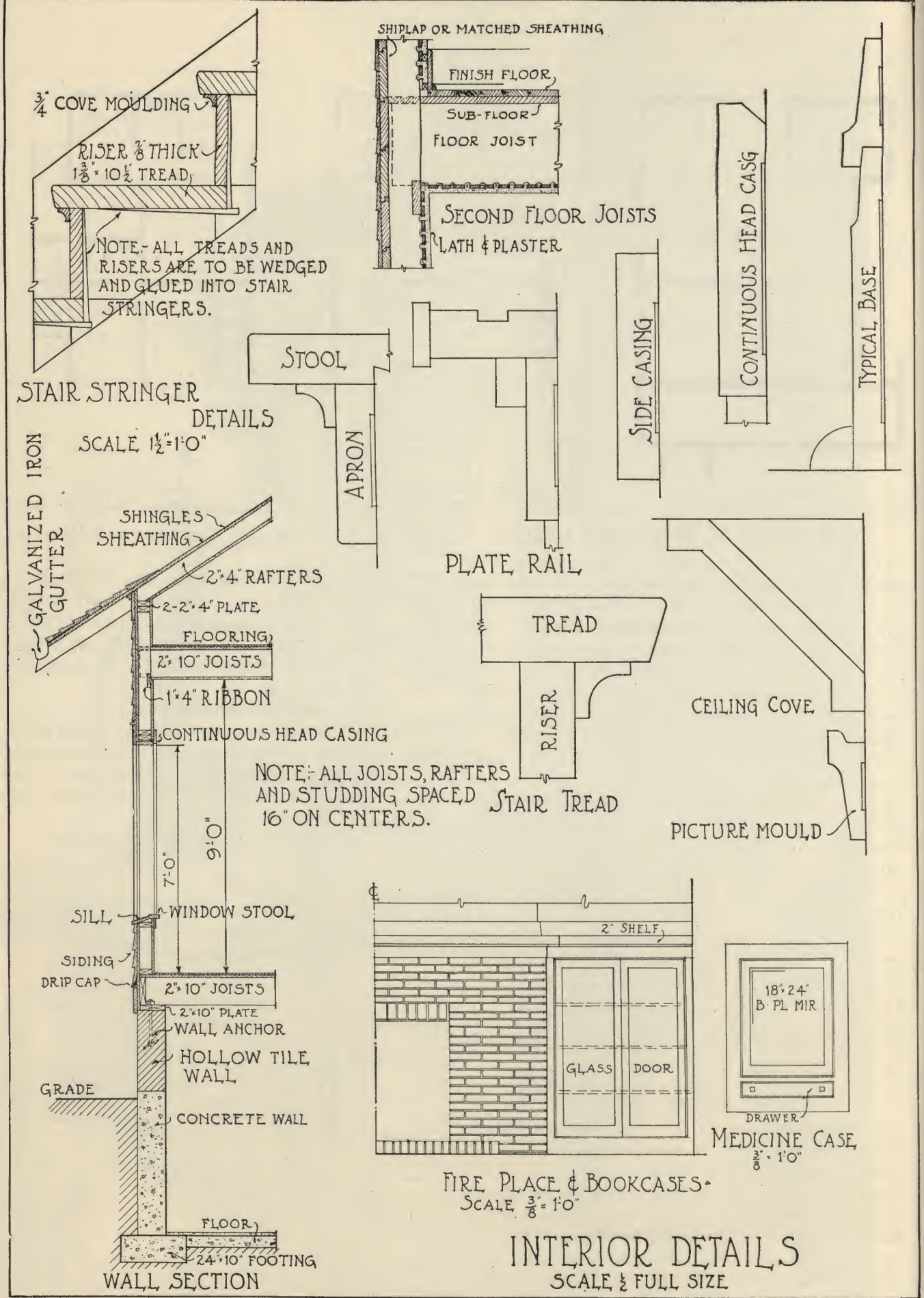
The kitchen and dining room are connected by double folding doors which can be opened so that the table can be stretched away out long and placed between these rooms at threshing time, silo filling, or for the big Thanksgiving dinner, when all the folks are home.

Basement Arrangement.

A feature of the basement arrangement is the large space that is provided in the corner for the storage of fruits and vegetables. This is placed away from the furnace and the laundry stove, and is shut off with a solid masonry wall.



Chemical Closet for the Toilet Off the Wash Room in Farm House. There Are Several Kinds That Give Good Satisfaction When Properly Installed.



Details of Inside Trim and of Construction Used in Model Nine-Room House No. 6772, as Illustrated on Page 113.

In exterior design this farmhouse follows the popular bungalow style—broad and low, well lighted and comfortable.

A JEWEL OF A BUNGALOW.

The convenience of the room arrangement in the design No. 6681 is one of its special features. The entrance is into a reception hall, which opens into the dining room on one side and the living room on the other thru cased openings. The hall in the middle part of the house furnishes the key to the convenience of getting from one room to another. This hall opens into every room except the kitchen, and makes it very easy to get around from room to room. There is an ample basement in this design and also the attic is available for storage. The attic stairs open into the hall mentioned, and the cellar stairs open from the kitchen.

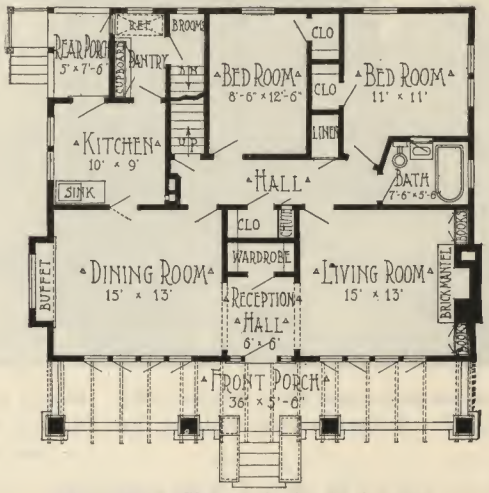
The appearance of this bungalow from the outside is particularly pleasing. The sides are shingled and can be finished in dark brown, while the trim is white. This presents a very pleasant contrast. A gable is built out over the porch near the front door with a pergola on each side. The pillars of the porch are made of cobblestones up to the top of the porch railing and above this they are shingled in harmony with the sides of the house. The effect of this porch with its trimmings of white is very artistic.

A BRICK AND STUCCO HOUSE.

New features in house building are shown in design No. 6636. It is 24 feet by 44 feet in size and contains nine rooms, counting the sun parlor and the sleeping porch as rooms. A side entrance in the middle of the left wall works into a plan of this proportion to good advantage. It offers an opportunity to build a handsome open stairway that may be entirely shut off from the other rooms in the house. One objection to open stairways in modern house construction is that they take up considerable room. Very often they create a draught that is more or less unpleasant.

There is very little waste room in this hallway, either upstairs or down. It is conveniently arranged on both floors so as to reach the different rooms without any unnecessary long passages.

There are many interesting features in regard to construction which are shown in detail on the three pages following. While the house is unusual in many respects, it will be noticed that there are no

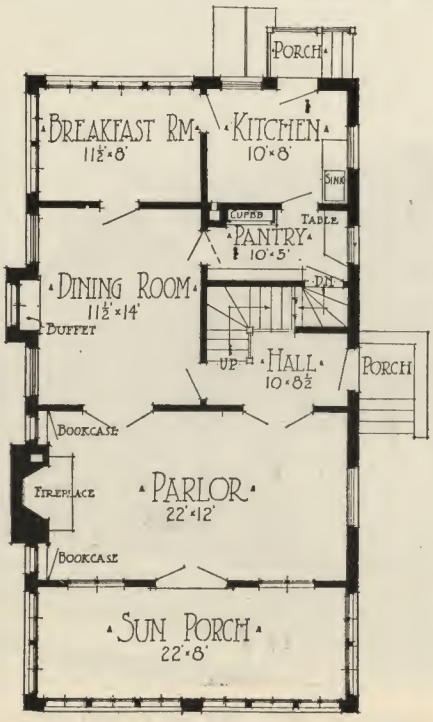


Floor Plan, Size 38 ft. by 31 ft. 6 in.

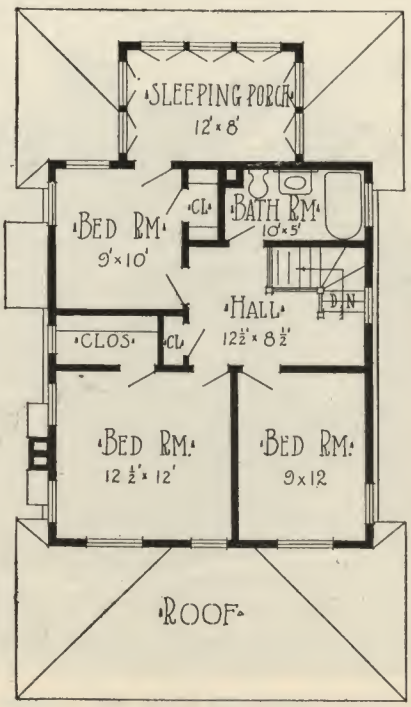
Artistic Bungalow of five rooms, 38 by 31 feet 6 inches. Design No. 6681. We can furnish blueprinted working plans of this building to any desiring them for only $6.00 per set.

Brick veneered and stucco house of nine rooms. Size 24 by 44 feet. Design No. 6636. We can furnish blueprinted working plans of this building to any desiring them for only $9.00 per set. For details of construction and of interior finish, see pages 155, 157, 158.

difficult details. The object is to use stock patterns of millwork that are carried regularly by lumbermen. These stock patterns are as attractive as special designs that cause delay and run into extra expense. In fact, the object in showing these patterns so carefully is to call especial attention to the combinations of stock patterns that work out so nicely in the trim.



First floor plan.



Second floor plan.

Arrangement of house, size 24 by 44 feet.

CHAPTER XX.

DETAIL DRAWINGS

Detail drawings are made to larger scale to show with greater accuracy the construction of some certain part. Sometimes they are made full size, but ofttimes smaller, even down to a scale of half an inch to the foot. No matter how large the scale the detail is drawn to, it is but seldom that every little part is shown. In representing a brick wall faithfully, for example, it would be necessary for the architect to show every brick. That would be a waste of time. All that is necessary to convey is how some certain part is to be constructed, how far certain bricks project, the color of some inset tile and its size. In cases where the design repeats itself it is only necessary to have one part shown in full detail, the other parts will simply have marked on them a cross with perhaps a note, "repeat design here." What is true of brickwork is also true of interior details, such as cornices, paneling, stair work, etc.

Comparing Detail with Finished Product.

The best way to get an idea of what a detail drawing means is to compare a detail sheet with the finished building and see for yourself. As a help in this direction we give a number of details and then show a perspective or picture of the completed part.

On the following pages will be found a variety of details that will enable anyone to get a pretty good idea of the subject. Before looking at the pictures look at the detail drawing and try to imagine how it is going to look and then look at the picture and make a comparison with your own mental picture.

Examine any detail drawing with the same care as you would the general plan and compare its measurements with the plan and in the case of any marked discrepancy call it to the attention of the architect or owner before going on with the work.

Interpreting Details.

Exposed interior woodwork originally was called "finish." It now is being designated by the word "trim," because "finish" also was employed by the trade to describe the manner in which interior woodwork was treated; that is, the rooms were "finished" in paint, enamel, wax or varnish. To get away from conflicting phraseology architects adopted "trim" as the standard term for interior and exterior woodwork exposed to view.

Sizes and designs of this exposed work (sometimes including materials other than wood) make or mar the appearance of a structure. It is important that the design be right and of proper proportions. It might almost be said that the proportions should be natural. A column, for example, should have the appearance of being able, as well as the strength, to support the mass above it. A 3-inch iron column would carry the load of the roof of a colonial porch, but such columns would give the porch a ridiculous appearance.

Special Trim Designs.

In structures of the more pretentious character all the woodwork, both interior and exterior, is specially designed by the architect. Usually the designs are special; that is, material of the exact pattern shown is not carried in stock by the lumber dealer.

Profile drawings and dimensions of each different size and pattern are shown on the blue prints. Sometimes these are grouped on pages by themselves, sometimes they appear on the sheets showing floor plans or elevations. Details also are given for plumbing, masonry work and other parts of the building that are special or unusual.

The "trim," its size and design, makes or mars the appearance of the finished structure. It should be given thoughtful consideration by the dealer, the contractor and the owner. Where there is real cooperation between the three parties most directly concerned in the building enterprise it is possible, on occasions, to substitute one design for another without affecting the appearance. The design substituted could be taken from stock and supplied at a much lower cost.

This applies especially to homes built from stock plans on which trim of a simple pattern usually is shown. Another pattern of the same general character, tho the face of moulded slide be slightly different, could be used with equally good results.

Where all the millwork is furnished by a sash and door factory and is delivered direct to the building by the manufacturer, the retail lumberman is not concerned in the transaction, unless he serves as agent for the contractor, which is unusual.

Because the "trim" is a practical and necessary part of every structure and because the dealer frequently is called upon to furnish every stick of wood that goes into a building, ability to understand a detail drawing is a valuable asset to the lumber merchant.

PLAIN TRIM—PLATE 1.

It may serve to get into this subject in any easy and interesting manner by showing four types of trim, two of which are extremely simple and two of an elaborate character.

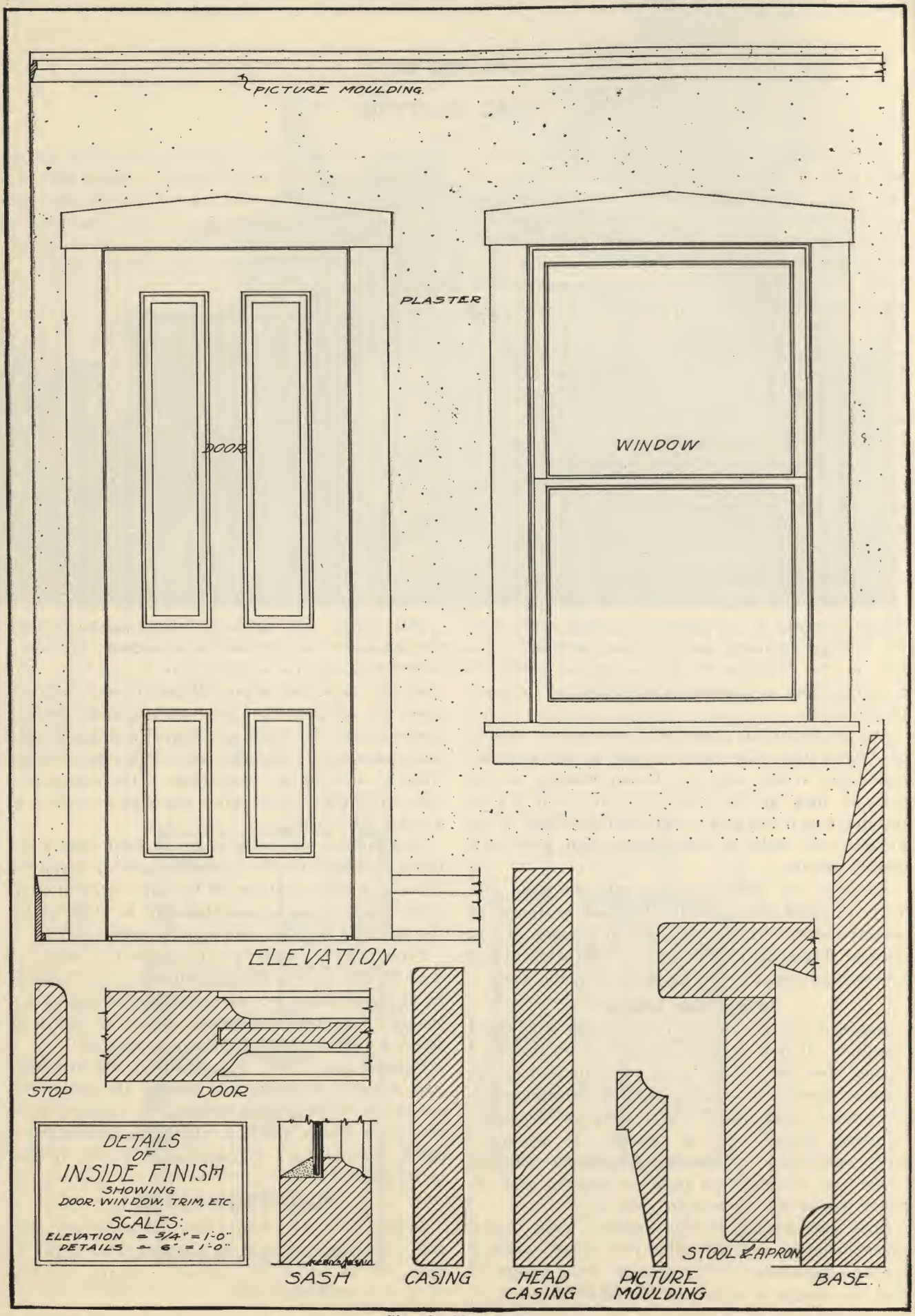


Plate I. Plain Trim.

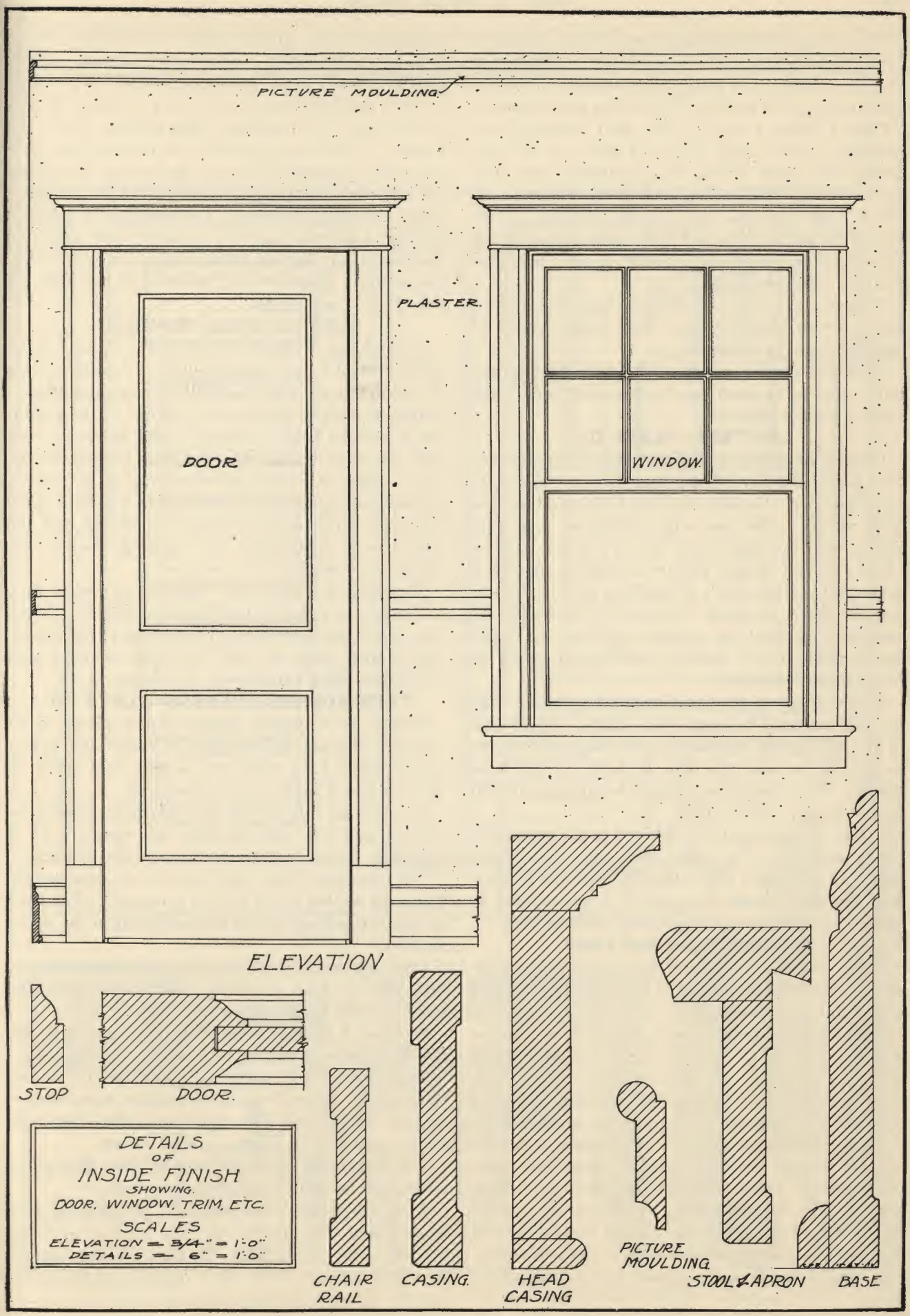


Plate II. Cap Trim.

In each case the drawings convey to the educated eye the same facts, viz., the appearance of the trim, and the manner in which it goes together; also the appearance of an opening after it has been trimmed.

Plate I shows a type of trim used extensively on cottages. Doors, door stop and sash are of stock design, the door being the regulation old style 4-panel door. The casing is square, the inner exposed edge (the one next to the opening) being rounded slightly. The old style cove cap is shown. This doubtless would be furnished in strip form and shaped by the mechanic.

Picture mould, stool and apron, base and quarter round are of stock design. The quarter round of modified form is pictured.

All the trim for a house in which the designs shown are to be used can be supplied from stock by the lumber dealer.

CAP TRIM—PLATE II.

Plate II illustrates a different style of stock trim. Two panel doors are shown and these are the stock veneered type. Usually they can be secured in pine, birch or oak. The door stop is different from that shown with the plain trim, but is a stock pattern. Chair rail and casing, picture moulding, stool and apron and baseboard are of standard pattern. There may be slight variation between the profile of the baseboard pictured, for example, and that the dealer has in stock, but a careful examination would be required to develop it.

In the detail of the head casing a separate bead and cap are used to secure two effects. The first is to give the cap the appearance of being recessed, the second to increase the size or bulk of the head casing. No substitution should be attempted that would destroy either effect.

Attention also should be directed to the sash. The upper sash shows six lights; the lower is a single light. If the entire bill is furnished by the lumberman the sash should be ordered if not carried in stock. The recommendation is an obvious one.

Mouldings, Names and Terms.

Before considering in detail the two more elaborate styles of trim shown it may be well to give a short talk on mouldings.

Mouldings are usually made in exact accordance with the draftsman's sections, the knives being made to fit the drawings. In making these full size sections the draftsman usually has in mind the effect that will be produced by their shades and shadows.

Altho mouldings used in connection with the interior trim are usually made in accordance with the architect's full size details, and hence are seldom alike in any two buildings, yet there are certain shapes that are so commonly used as to have specific names, while class names have been given to mouldings used for particular purposes, irrespective of the shape of the members. Among the former may be mentioned the quarter-round, half-round, cove, thumb-mould, congee, ogee, fillet, crown, scotia, astragal, bead, quirk and double bead. The quirk is not a moulding proper, but it is a groove formed at the side of a moulding that is sunk below the surface. When several beads are put together they are called reeding, and when the curves of reeding are reversed to concave instead of convex, we have what is known as fluting. The names of mouldings used for a distinct purpose, no matter how much the mouldings may vary in their profile, are cap-moulds, base-moulds, band-moulds, bed-moulds and flush or raised panel mouldings.

Solid and Spring Mouldings.

A moulding, irrespective of outline. is said to be either "solid" or "sprung." It is "solid" when the wood fills the space behind the moulding proper, usually to a right angle, and "sprung" if the moulding is worked from a piece of wood in such a way that the back is parallel to a line tangent to the face. When a "sprung" moulding is set in its proper place against the board, there will be a space behind it. The ordinary crown moulding and the larger cove mouldings are "sprung," while the others are "solid."

Mouldings are said to be "planted on" when they are nailed or glued to the face of a board as is the case with band mouldings. In addition to the mouldings proper, there are also the bevel, chamfer, and the rebate used extensively in interior work.

TRIM FORMING PANELS—PLATE III.

This is an elaborate design and is given as an example of good architecture in rooms and apartments which have sufficient breadth and scope to them to take kindly to such treatment.

In reading this detail the elevation should be studied and the various parts or members of it should be located before taking up the detail.

The elevation of the door shows five cross panels. The cross section of the door is veneered. (The kind of wood to be used would be mentioned in the specification.)

Cross section of sash also shows a veneered surface and an inset moulding, the two forming the same pattern as the stop.

Sections A-B show stool and apron and also the use of an ogee moulding to complete the panel.

The cornice is composed of four members (sections C-D), two of which are plain face, hollow backed strips, and two ogee moulding members, again employed to create a panel effect.

The remaining members, casing, base and panel strips, can be easily located and applied.

After the design is understood it is relatively easy to ascertain the quantity of each kind of material needed. The members on this trim are very simple in design. Much of the effect depends on the workmanlike manner in which the trim is put on.

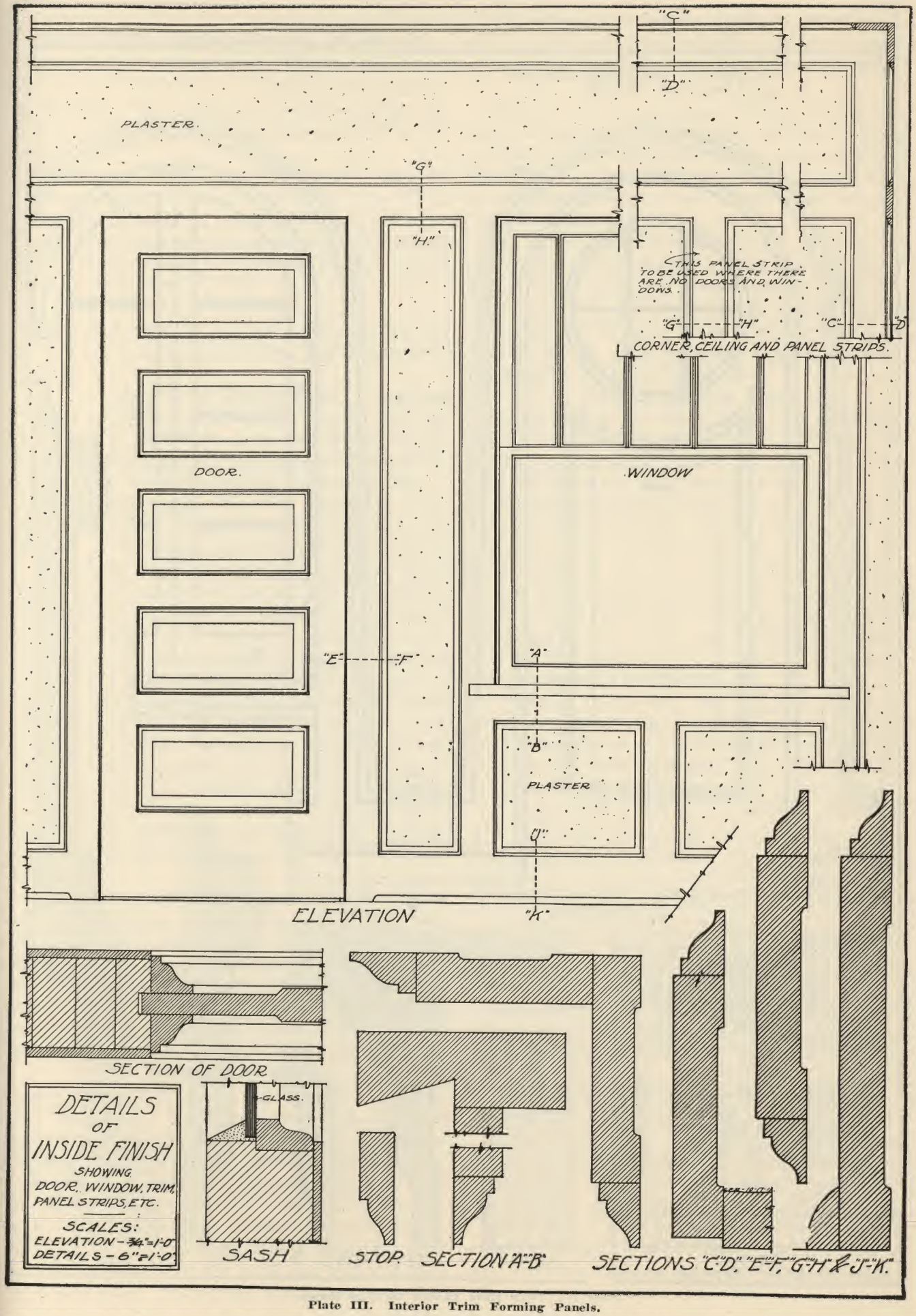


Plate III. Interior Trim Forming Panels.

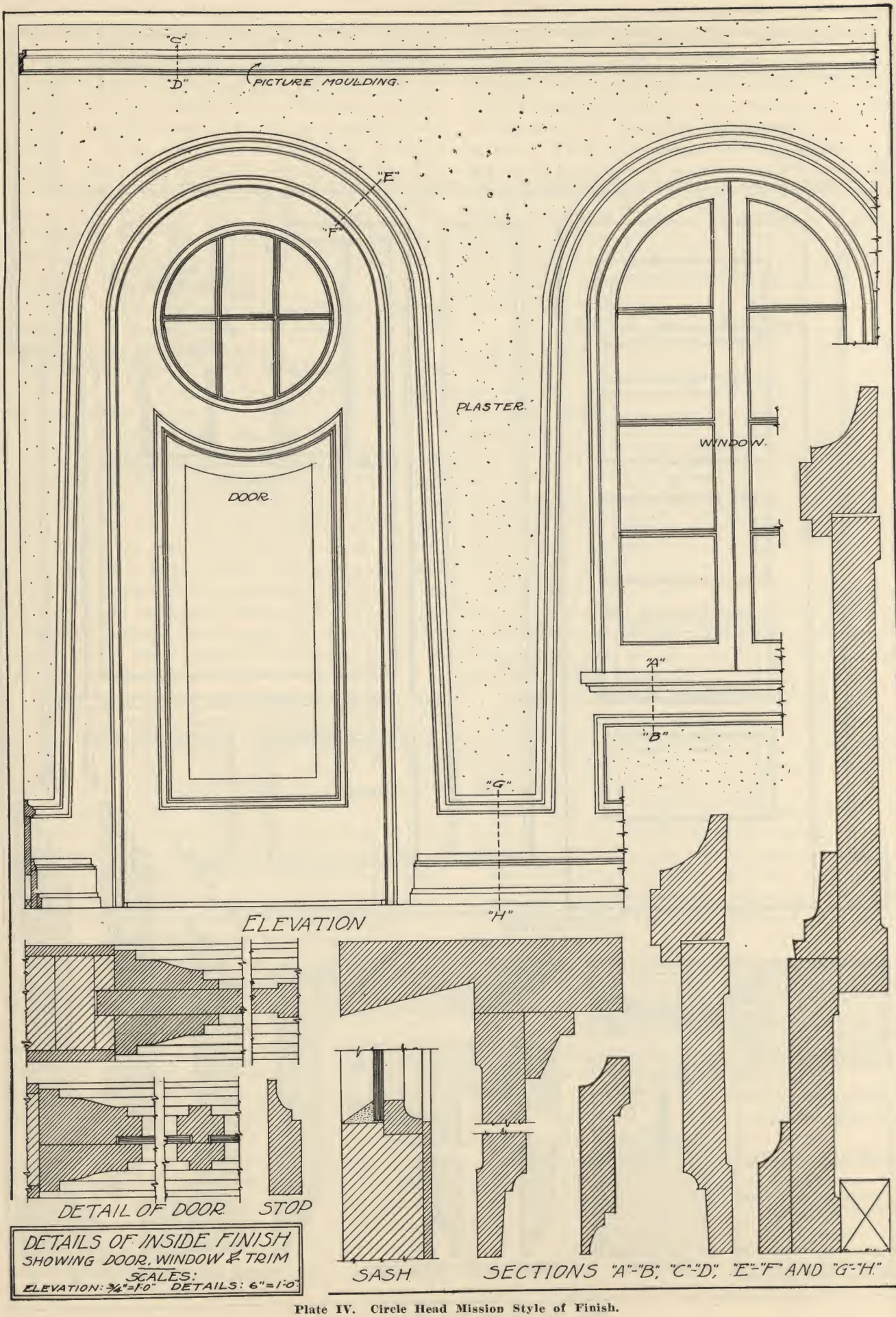


Plate IV. Circle Head Mission Style of Finish.

CIRCLE HEAD MISSION TRIM—PLATE IV.

In this detail both doors and windows are special and must be constructed to design for this particular building. The windows are casement hung, and that fact is shown by the two stiles meeting in the center.

Details given in the cross section show veneered doors and sash.

Casings, composed of two members, call for accurate millwork and careful installation. The widths where the casing joins the circle and the base should be exact in window and door.

The base is built of five members.

The grand result of the trim when installed and finished is a multiple panel effect that is extremely pleasing.

Putting up Interior Trim.

While on the subject of care it may be said, for the benefit of all, that the very best design and the very best materials will not produce satisfactory results if the work is carelessly or slovenly done.

Certain information of value, respecting terms and methods, is here given in connection with suggestions on the proper installation of interior trim:

The manner in which inside trim is put up varies with the quality of work desired, and also greatly affects the appearance of the work, particularly when it is stained or finished in its natural color. In painted and other ordinary work, the different parts of the trim are simply nailed to the wall or grounds, and to the edge of the frame. The heads of these nails are sunk beneath the surface of the wood and puttied. In order to conceal the nail holes as much as possible, for they are usually visible even when well puttied and painted, the nails should be driven in the quirks of mouldings when possible. In nailing a hard wood trim, the hole should be bored for the nails in order to prevent splitting.

In ordinary work the trim usually comes in pieces of random lengths of from twelve to sixteen feet. No casing or architrave, however, should ever be spliced, as this is not considered admissible even in the cheapest work. It is well, in order to avoid as much nailing as possible, to have many members of the trim glued together on the bench, and this should be required in all good grades of work.

Priming in the Strip.

In order to hasten the completion of a building, and to make the inside trim "stand" better, it is customary to fill the trim before fixing it in place. In good work it is usually painted on the back also.

Excepting in the very cheapest work, the trim should not be put up as it comes from the machine, but should be first smoothed and sandpapered. This, on all plain surfaces, should be done with a smoothing plane if of soft wood and with a scraper if of hard wood. The surface should then be sanded. On moulded work most of the smoothing is done with sandpaper.

Machine Polished Trim.

Most of the woodworking establishments have polishing machines for the smoothing of plain surfaces, and this work is always superior to hand smoothed work, but very little polished trim is ordinarily sent to a building except where it is worked and put together at the mill.

One of the most important requirements, in the putting up of the interior trim is, that the joints should be as tight and inconspicuous as possible. There are various joints used in connecting interior woodwork and fittings. Work is usually said to be butted, mitred, matched, coped, housed, or glued according to the kind of joint used.

Joints in Interior Trim.

A butt joint is the easiest and at the same time the least desirable joint made. It is simply the butting of one piece against the other, and the slightest shrinkage will cause the joint to open. It is also difficult in making this kind of a joint to keep the two surfaces joined on exactly the same plane.

A mitre joint, used principally in making the exterior angles, is made by beveling the parts joined, so that the plane of the joint bisects the angle. The mitre when skillfully done makes a handsome joint, but is apt to open at the inner edge. To prevent this the joint should be glued, and in the best kind of work it should be doweled.

A tongued and grooved joint is a form of joint in which one edge is grooved and the other has a projecting tongue which fits it. Boards, tongued and grooved are called "matched," and when one edge is beaded they are said to be "matched and beaded."

A coped joint, which is used only in connection with mouldings, is made by cutting the end of one moulding to fit the profile of the other. A coped joint has the advantage over a mitred joint in that the joint does not open as badly in case of shrinkage.

A housed joint is one in which the end or edge of one member is wholly let into a groove in the side of the other. This joint is used principally in stair work.

Many joints in the better grades of work are made by gluing the connected parts together, and where possible by gluing blocks of wood into the re-entering angle.

FLAT-MOULD INTERIOR TRIM—PLATES V AND VI.

Reference to Plate V will bring up for your inspection the "bungalow" or flat-mould type of interior trim. It will be noted that all trim, except the modified quarter-round, is shown square edge.

This trim could be worked out by the carpenter from stock supplied by the dealer. If the trim is of soft wood this would be the most economical method of handling this feature of the bill.

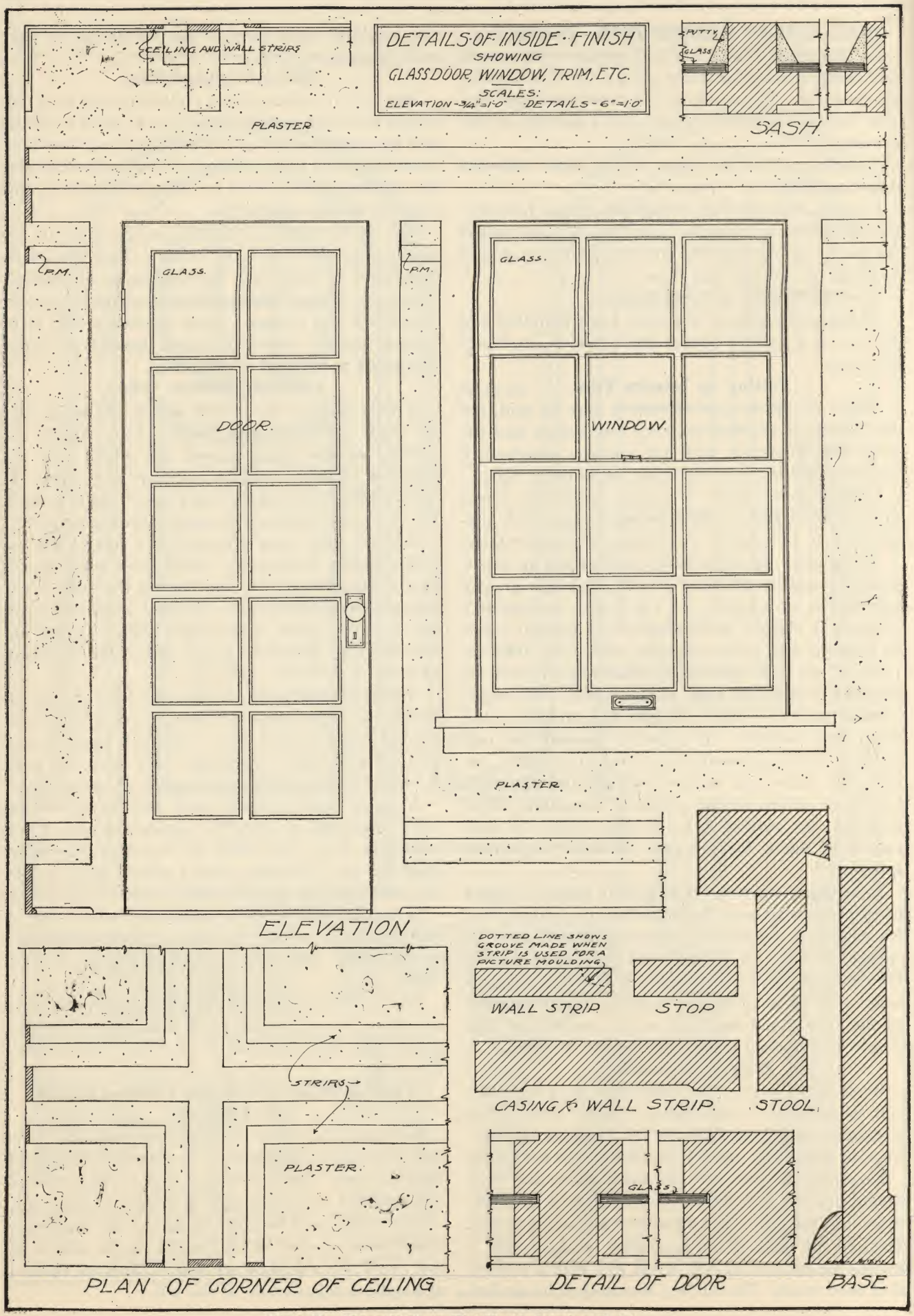


Plate V. "Bungalow" or Flat-Mould Interior Finish.

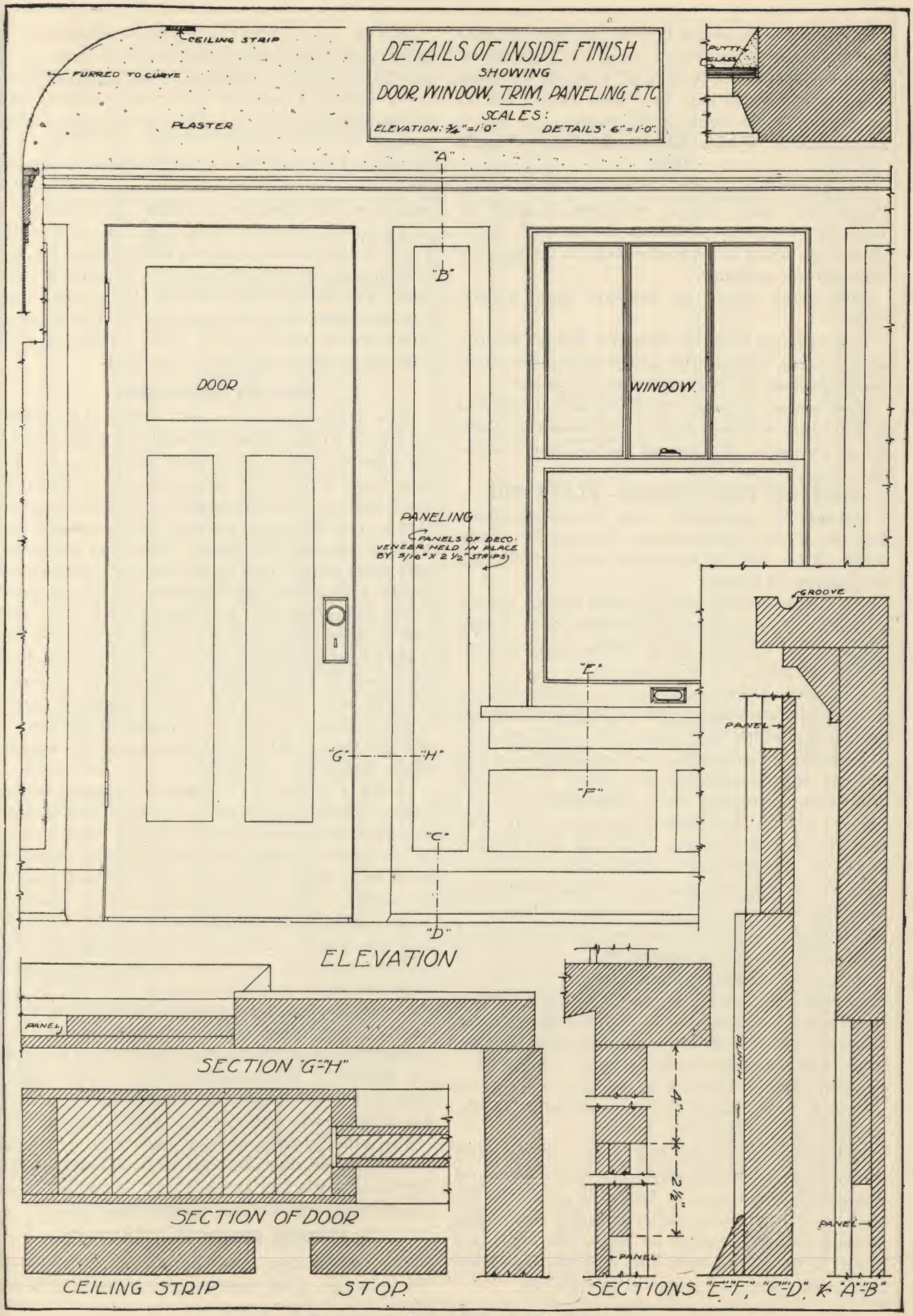


Plate VI. Craftsman Style Interior Finish.

In reading these details it should be borne in mind that the reader is looking for ideas and suggestions, not for opportunities to take off a bill of materials. Many of the items and ideas here shown will be found on bills you figure in the future.

ELABORATE WALL PANEL EFFECT—PLATE VII.

In Plate VII an elaborate example of interior trim, giving wall panel effects, is shown to good advantage. Particular attention is directed to the detail C-D, which is instructive both to the material man and the mechanic.

Sash detail shows an ordinary sash without veneer.

Doors appear to be of standard design, but reference to the cross section and measurement of the panels discloses the fact that they are special.

Cross section of casing shows the style illustrated in Plate II is reversed, a fact which cannot be shown on the elevation. The plan of the face would be the same in both cases.

CONSTRUCTION DETAILS—PLATE VIII.

Methods of construction must be understood before one is able to arrive at an accurate list of materials to be used in producing what actually has been shown on paper.

A cross section of a building, for example, usually shows in what manner the structure is to be put together and the sizes of its various members and component parts.

Frequently, however, the architect draws a detail to show the sizes and kinds of materials and the manner in which they should be put together. Architects are not infallible and sometimes it is possible to suggest substitutions which, if adopted, prove both an economy and a betterment.

Fig. I in Plate VIII shows a solid 6 by 6 sill. Fig. II in the same plate shows a sill built of two pieces of 2 by 8. The latter is the better form of construction. On a basis of economy the second method also has the preference. A 6 by 6 timber contains three feet of lumber to the running foot; two pieces 2 by 8 contain 2⅔ feet to the running foot.

On a Practical Basis.

The sill is that part of a house that ties the superstructure to the foundation. Upon it rests the floors and walls and thus the responsibility of keeping the house firmly anchored to the ground. How well it serves its purpose depends largely upon the manner in which it is designed and its relation to the masonry underneath.

In Fig. 1 in Plate VIII is a type of sill found in many of the old houses, built at a time when wood was plentiful and close at hand. It shows the sill made of a 6 by 6-inch timber with the floor joists notched out and resting on top. The studs are spiked to the side of each joist with the ends bearing directly upon and toenailed into the sill.

In Fig. 2 in Plate VIII is shown practically the same construction except that the sill is made up of two 2-by-8's spiked together. This form not only saves wood, but keeps all the framing timbers to a 2-inch thickness, and is quite as good as the former method.

In Fig. 3 in Plate VIII is shown a type of box-sill, built of 2-inch timbers, which has several advantages over the other two methods. In both Figs. 1 and 2 the studs bear directly upon the sill while in Fig. 3 the joists rest upon the sill as before but are held in place by a 2-inch plank (X) spiked to their ends. The whole is then covered by the rough floor boards. Flush with the outer face of this plank is laid a 2-by-4, spiked to the joists. This acts as a plate upon which the studs are erected.

Good Sill Construction.

This method permits of two things. As timber shrinks in width and not in length, in Figs. 1 and 2 the floor will settle as the joists shrink out, but the base board will remain stationary as it is nailed to the studding. The shrinkage is very often so great that a crack is opened between the base board and the floor all about the room. When that occurs the only thing left to do is to put down a shoemould as in Fig. 1 which not only covers the crack, but tends to aid in keeping dust and dirt out of a place difficult to reach with a broom. In Fig. 3, however, the studding being placed on top of the joists settles with them so that the above difficulty is overcome. Also, an 18-foot stud, which is the economical length to buy, will give greater story heights by the method of Fig. 3 than in either 1 or 2, as is evident by a study of the details.

In Fig. 4 in Plate VIII is shown a type of sill becoming widely used by architects as it embodies all the good features of sound building construction. In the previous figures the foundation is shown to be of stone which calls for a heavy sill well bedded in mortar. Where the foundation is of concrete, anchor bolts are set and to them is bolted the single 2 by 8-inch plate which forms the sill. The joists are notched half way over this sill-plate, which leaves room for the 2 by 8-inch header (Y) and for the studs which are notched over it. Note that the studs are cut ½-inch short of the depth of the header (Y) so that they bear only upon the header and not upon the sill-plate. This permits of their being securely spiked thru the header into the joists and of an equal settlement with the floor as the joists shrink.

The other details of wall coverings, trim and moulds merely show different ways of handling different materials and any one may be applied to all the different forms of sill construction.

A PROPER WINDOW—PLATE IX.

The construction and installation of window frames is one of the most important phases of build-

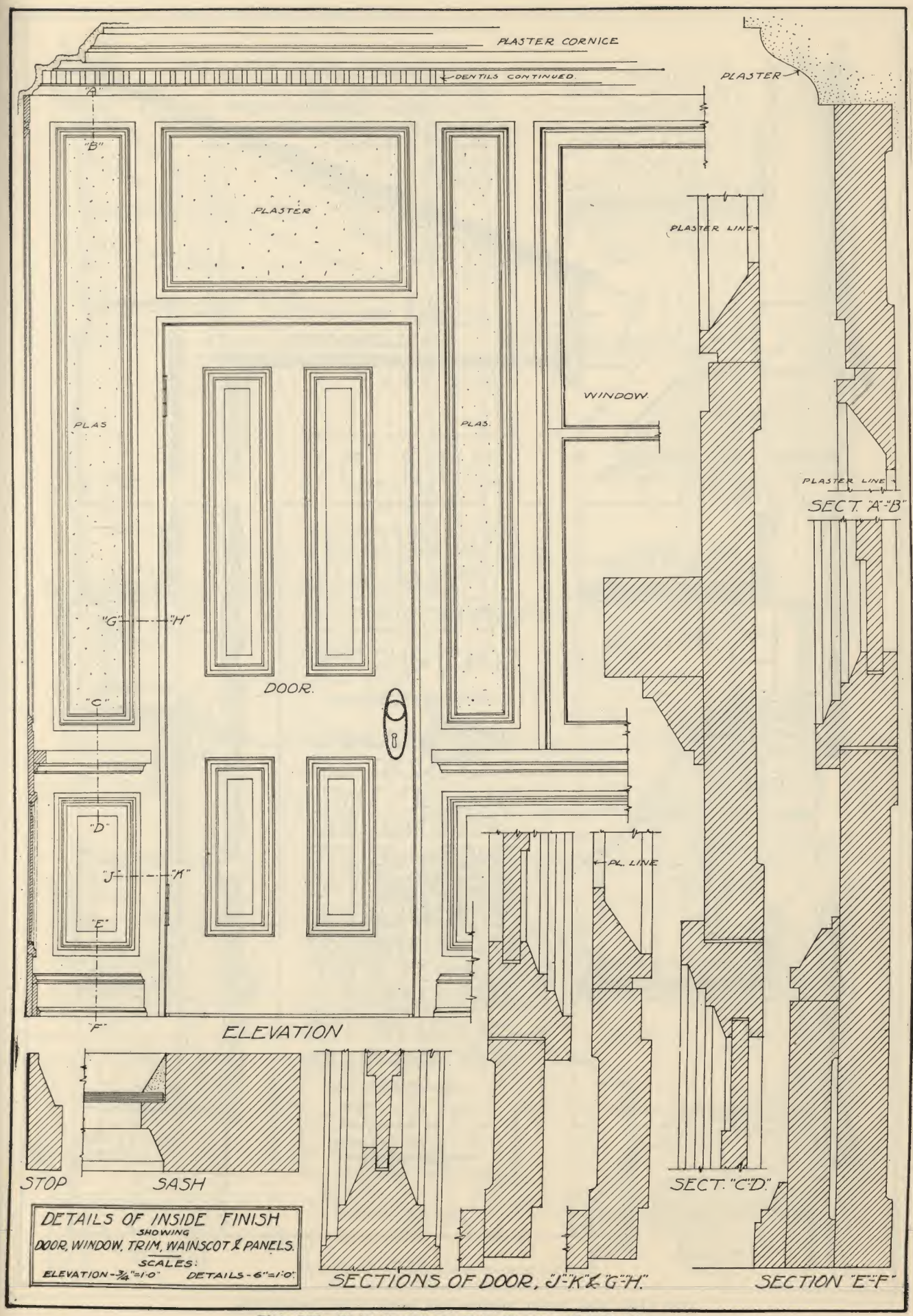


Plate VII. Elaborate Interior Trim Forming Wall Panels.

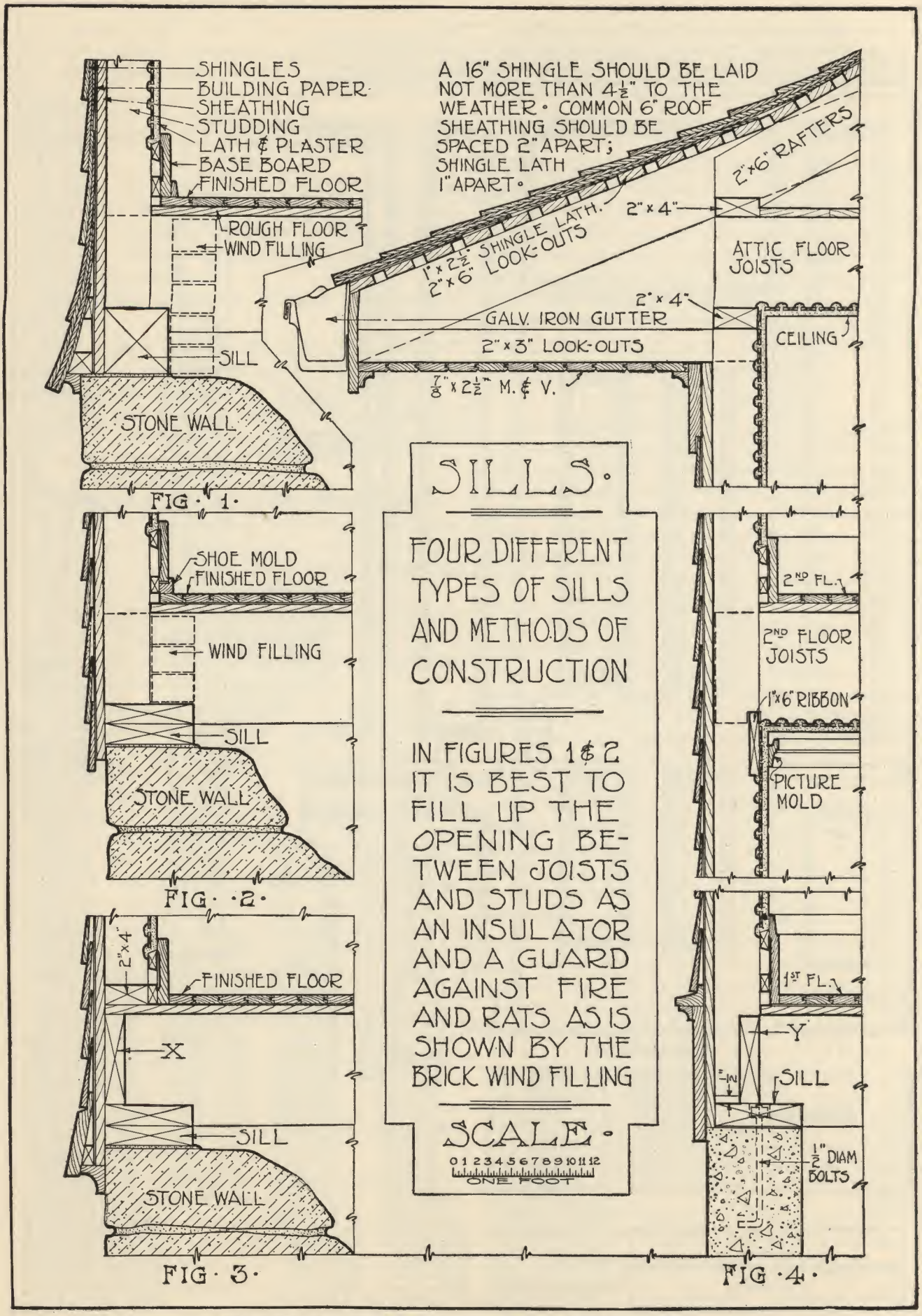


Plate VIII. Scale Details Showing Four Types of Sill Construction.

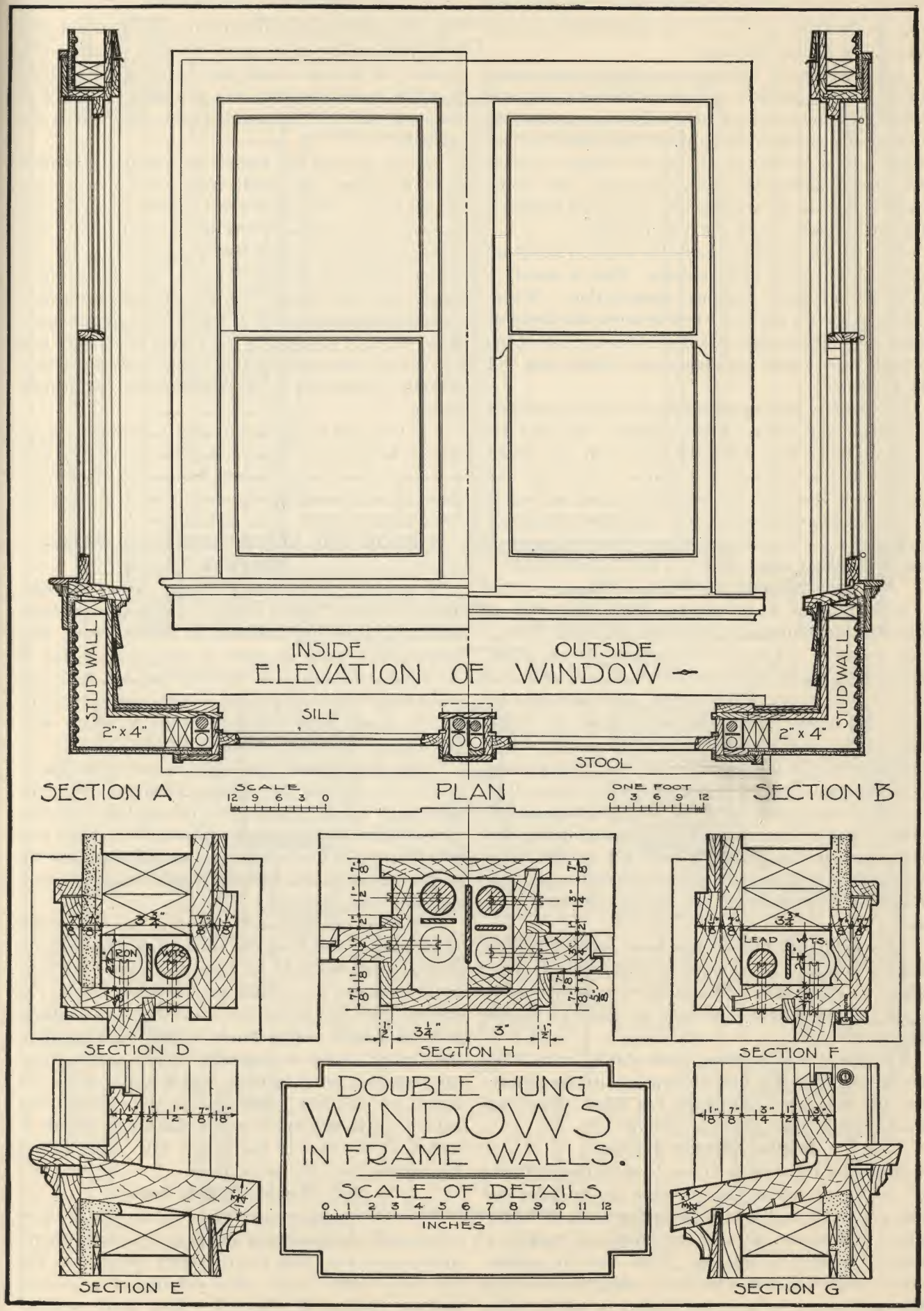


Plate IX. Details of Double Hung Windows in Frame Walls.

ing construction and one of the details that receives very little serious attention.

A large share of leakages in a house occur about the door and window frames. Windows sag and bind and a hard driving rain will get in around the casing and discolor the plaster and paper on the walls. It is all due to one of two things. Either the stud framing has been carelessly and inadequately done or the window box is not well designed, the latter reason being the most probable.

First of all, studding should be doubled about all openings for doors and windows. That is merely a principle of good building construction. Where openings have a span of 4 feet or more, the lintle or head should be trussed. If this is done, much of the trouble experienced from loose and binding sash will be overcome.

It is equally good construction for the box entirely to enclose the space for the weights. In Plate IX sections A, D, E and the left half of H are shown details of the ordinary box frame. Note that the pulley-stile and yoke are made of 7/8-inch material; that the lath and plaster cover the inside of the box, and that the sill section permits of no drainage of water under the sash, which are but 1½-inch thick.

Strengthening the Window Frame.

In sections B, F, G and the right half of H of Plate IX the pulley-stile and yoke are made of 1⅛-inch material. This gives strength to the two members of the frame which receive the most load and strain. For heavy windows the yoke may well be made 1⅜ inches thick. The box is made up of the pulley-stile, outside casing and ground casing, which entirely encloses the space for the weights, insuring freedom from dirt and fallen plaster in a space that in any event is none too large when kept clear and clean. The sill is cut to form a space under the lower sash for the water to drain out quickly, thus keeping the moisture from being retained a sufficient length of time to start rot in the sill, stool and apron.

Also note that the sill has been grooved at the bottom to permit the shingles or clapboards to enter about ¾ of an inch. This tends to make the joint water and wind tight. The sash are made 1¾ inches thick.

The inside stop is put on with slotted metal stop adjusters. This will give an opportunity for adjusting the sash after shrinkage has taken place and thus avoid a loose, rattling window.

Mullion Window Frames.

In section H, which is drawn to show two methods of making a mullion, iron weights are used for the cheaper work, and lead weights for work of better grade and where the sash are large and require a heavier weight to balance. Even tho the pulley-stile is made 1⅛ inches thick, by using lead weights the mullion can be kept to 6 inches in width, altho 6½ inches is better, while with iron weights and only a ⅞-inch pulley-stile, there will be required 6½ inches. If for any reason the width of the mullion must be made less than the 6½ inches, then it is better to omit the pendulum rather than crowd the weights.

Section D may be helped by placing a plaster ground around the inside stud, as shown by the dotted lines. This will leave a greater space for the weights, as is shown in left side of section H. The serious objection to this and a good reason for the better method of section F is that the strain which comes upon the frame when the windows are raised and lowered is in section D transferred to the inside trim, which in time works loose from the plaster and opens up at the corner miters, while in section F it is directly transferred to the studding by the ground casing.

For the sake of the finish, sash lock stops should always be put on. They cost little or nothing and certainly prove their worth in keeping the lock from marring and damaging the stop at the top when the lower sash is raised to its full height.

WINDOW FOR BRICK VENEERED WALL—PLATE X.

In general, the details of a box frame for windows in a brick veneer wall are the same or at least similar to those for windows in frame walls. The differences are not so much in the shape or size of the several members as in their connection to the wood frame and brick work. These differences are clearly shown in the details in Plate X, which may be compared to those shown in Plate IX.

Where the window opening is broad and a heavy mullion is desired, the weights from the two windows may well be contained in the mullion. In that case, Sections B and D show details of the head and sill. Section B also shows the use of brick for the outside masonry sill, while Section D shows a stone slip sill. See Plate IX.

In the head of Section D note that the face of the yoke is two inches from the brick jamb. The outside casing is cut short to fit snug up against the iron lintle, as is also the outside stop, which is 1⅜ by 1⅝ inches. For the jamb, the lintle would be omitted and the outside casing would extend back equal to the ground casing as indicated by the dotted lines, the first stud being omitted, which would leave 2½ inches for the box. The outside stop would then extend up to the brick work, making it 1⅜ by 2 inches, or the face of the pulley stile would be set 1⅝ inches from the brick jamb.

Sash Weights In Side Boxes.

Where the window opening is too narrow to allow a box mullion, Sections A and C show details whereby the sash are hung from weights confined in the two side boxes which then permits of a narrow mullion, Section H, Plate X. This detail will re-

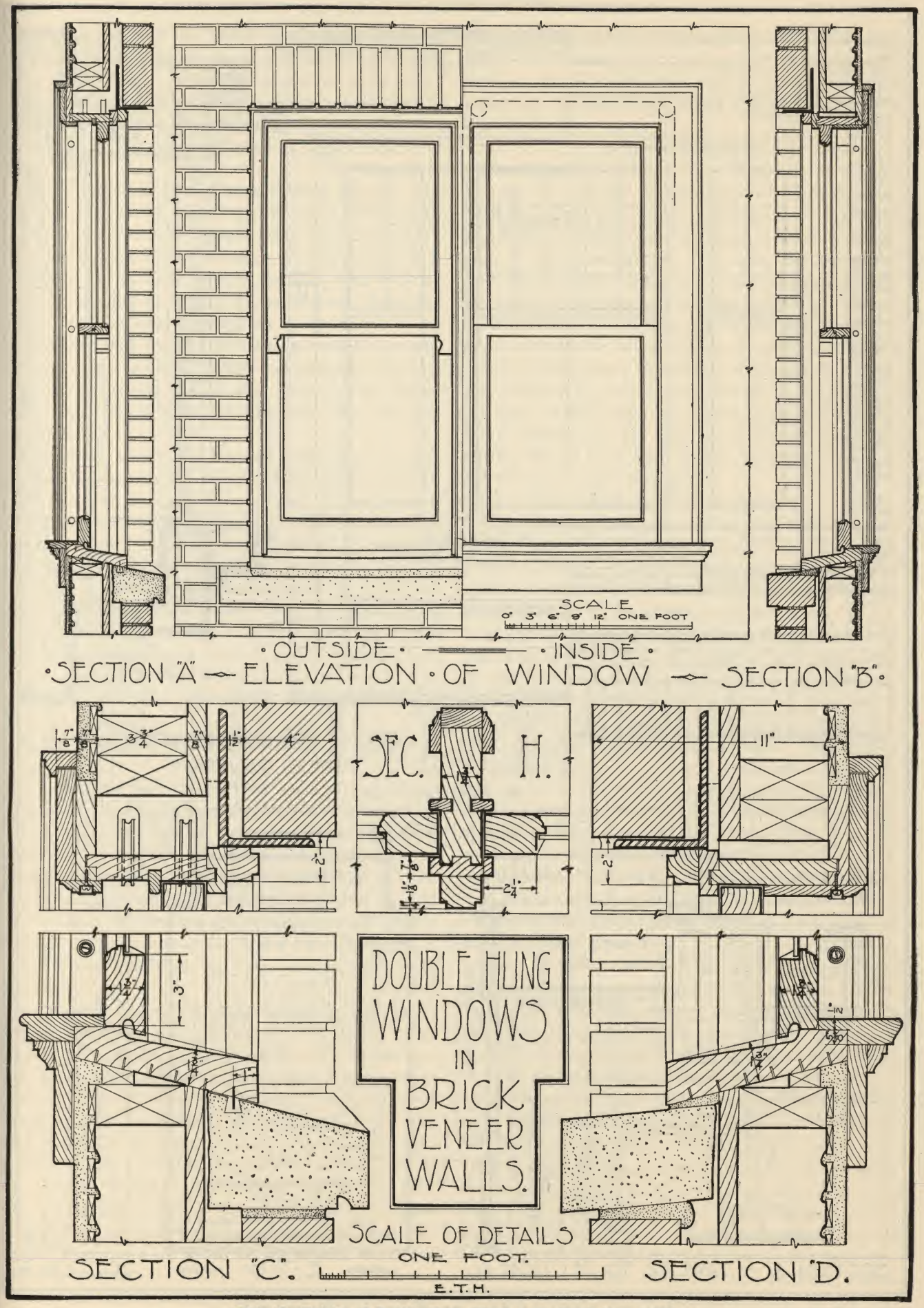


Plate X. Details of Double Hung Windows in Brick Veneer Walls.

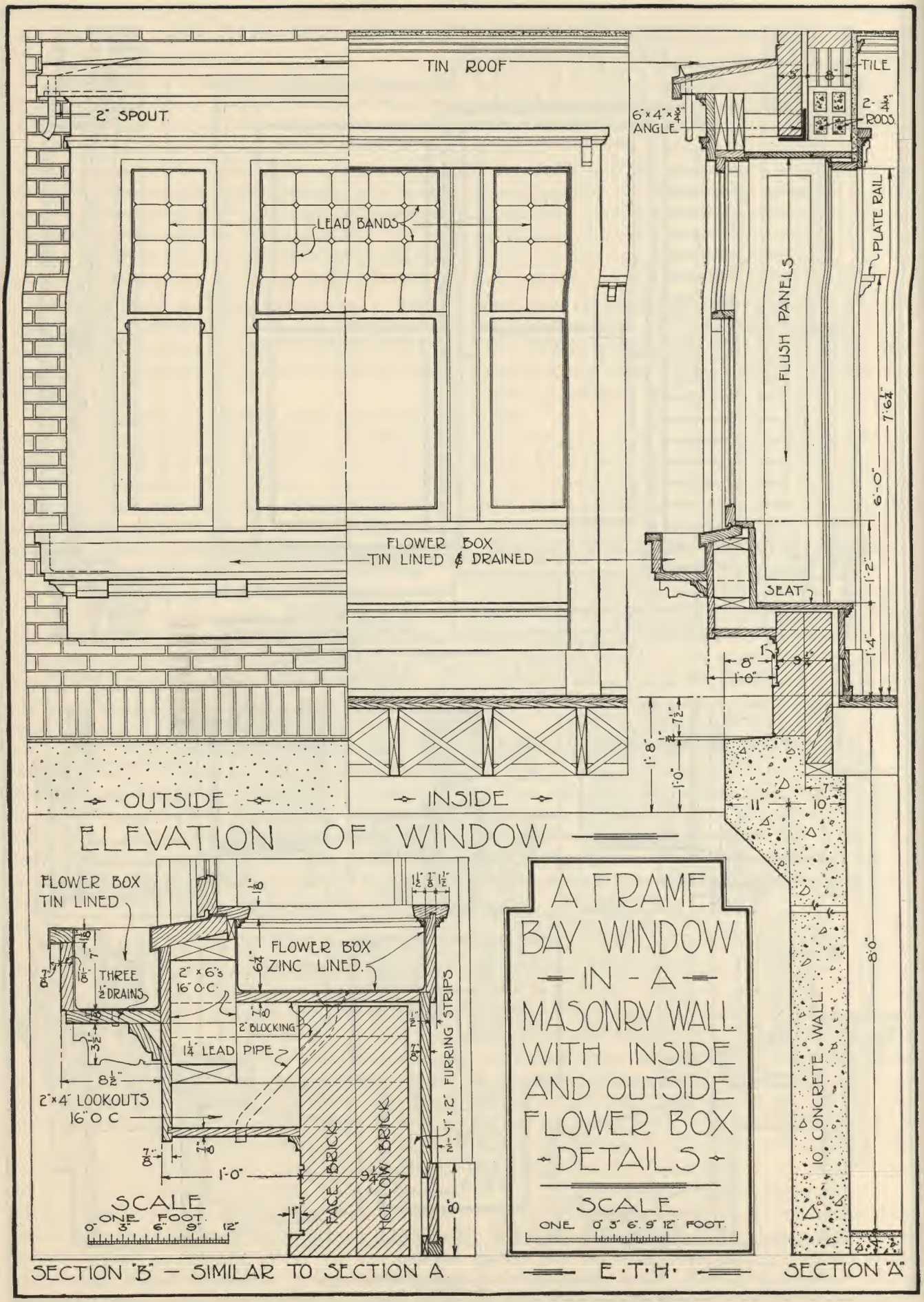


Plate XI. Details of a Frame Bay Window in a Masonry Wall.

quire overhead pulleys, which are readily obtained from different manufacturers of hardware. The head of section C makes allowance for these overhead pulleys by framing out a space equal to that allowed in the box for the weights. In other respects, the details for both types of windows are the same.

The sill section of C shows a stone lug sill and the best method of fastening the wood sill to it to insure a weather-tight joint. Into the stone sill 1 inch back from the outer edge of the wood sill a groove is cut ¾ inch deep by about ½ inch wide at the top tapering to ¾ inch at the bottom. Into this groove a galvanized iron spline ⅛ by 1 inch is securely cemented and let into the wood sill ½ inch. This gives a very satisfactory sill construction and with the drips cut in the lower sash and the stone sill all chance of water getting into the frame is minimized.

Section H shows one way of forming a narrow mullion to go with the details of Sections A and C, Plate X. The frame proper is made from 1¾-inch material, which should be thoroly seasoned and kiln dried or there will be serious danger of its warping and causing the sash to bind. If the design will permit, the mullion may be widened ⅞ inch and instead of being made in one piece, be built up of three pieces each ⅞ inch. In that case the frame of Section H would be divided and a ⅞-inch piece or core inserted. This would give a very stiff construction and lessen any chance of its warping out of shape.

A BAY WINDOW IN MASONRY WALLS—PLATE XI.

A detail that greatly helps the looks of a residence both inside and outside when properly designed, is a bay window. It may be a complex and ornate structure or a very simple addition, depending on the type or style of the house on which the bay is built. It may or may not be of the same material as that of the house proper, but again, that depends largely on the type of architecture under consideration.

For frame buildings, it is unquestionably best to make the bays of the same construction thruout. For masonry walls, the same thing applies where the bay becomes a structural as well as an ornamental part of the building proper, but where the bay is frankly used as an accenting feature on the exterior, then it may be properly constructed of wood. Again, the interior design may call for just such a feature to carry out and terminate an axis, a view or vista originating in some other part of the interior design. In that case, the bay may be frankly made to express the true intent of its purpose and not necessarily act as a part of the exterior design only as it is made to harmonize with the building proper.

Plate XI shows a frame bay in a masonry wall, that is a hollow tile wall faced with brick on the first story and stuccoed on the second. It is designed both as an interior and exterior feature since it comes on the axis of the room and also serves as a central window motive.

Window Elevation.

The elevations of the window with section A show this bay as a simple, straightforward effort to serve both the inside and outside requirements in materials and design. Horizontal lines are accented in the design of the house proper, therefore, the horizontal lines are accented in the bay, relieved somewhat by the double mullions with brackets directly under.

In order further to carry out the harmony and give greater character to the design, the meeting rails are raised a little above the center of the window opening, making the lower sash greater in height than the upper sash, which have their glass divided into small squares by flat lead bands which cause less obstruction of view than do wood muntins and permit of much easier cleaning.

Built-in-Window Seat.

In section A, Plate XI, the interior reveal is utilized by a built-in seat and is suitable for the living room or library. Casement sash, swinging in, could well be used instead of the double hung sash, and in many ways have advantages over the latter.

In section B, Plate XI, is shown both an exterior and interior flower box. The outside box is the same in both sections, lined with tin which is carried up over the sill and flashed under the stool. The inside box is lined with zinc and drained by a single 1¼-inch lead pipe carried to the outside. This section is more desirable for a dining room where the window space is often given over to the cultivation of house plants and winter flowers and affords greater space and more cleanly facilities for such than the usual plant shelf with its array of pots and vases.

DORMER WINDOW DETAIL—PLATE XII.

A part of the house that is often neglected and wasted is the attic. In probably the majority of houses, costing from three to five thousand dollars, we find no means of getting into the attic except possibly, a scuttle in the ceiling of the second story hall. And oftentimes where there is a stairway to the attic, it is in such a position that the main roof cuts off adequate head room so that one has to stoop in order to pass up the stairs.

Supposing the house under construction is of such a design that the roof affords ample space beneath for rooms in the attic. A stairs from some convenient point on the second floor will make possible the use of a space equal to from one-third to two-thirds the area of the second floor for many useful and convenient purposes, such as storage rooms of all kinds, clothes drying space for rainy days, billiard room or play room for the children, extra sleeping rooms for the accommodation of the un-

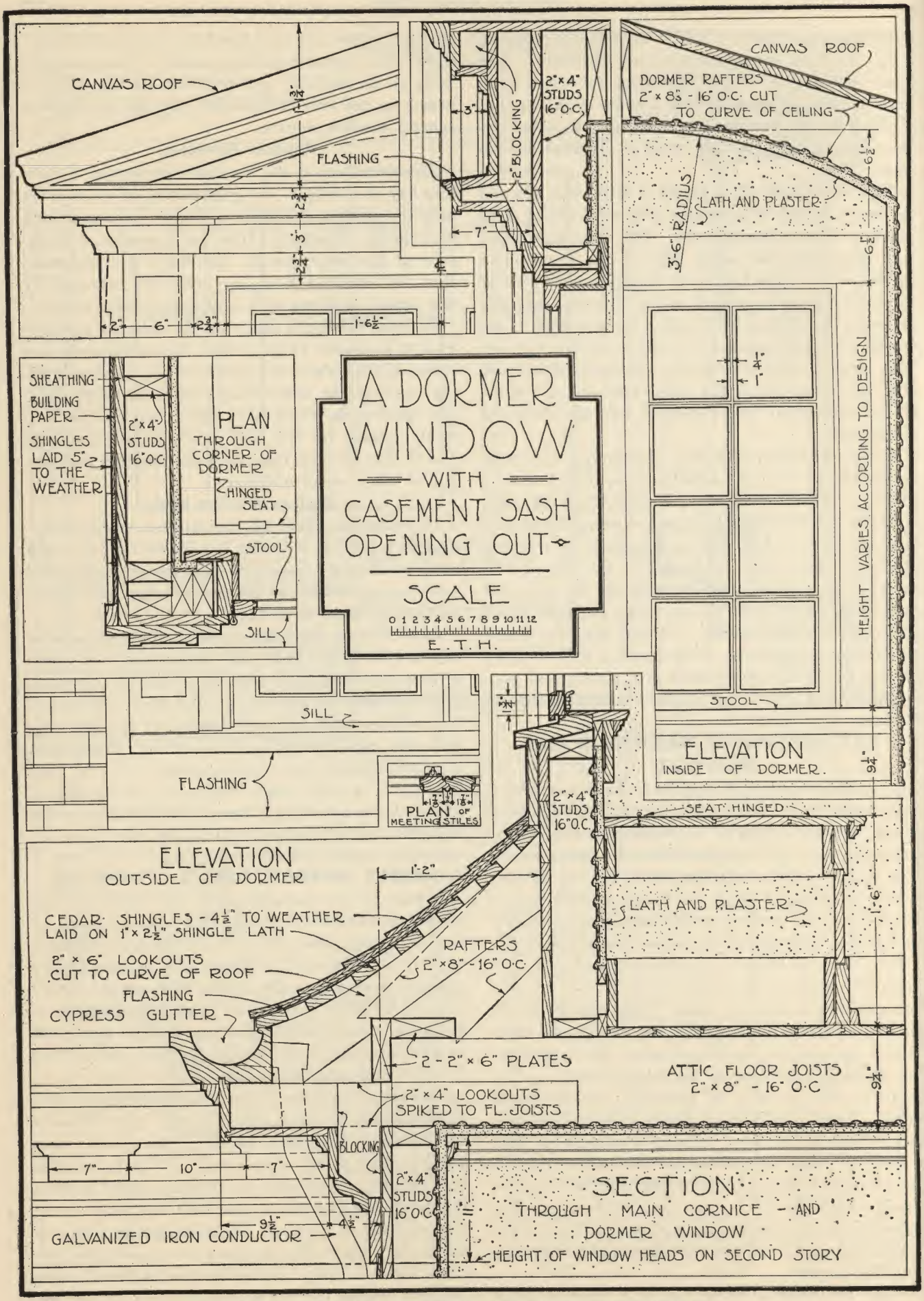


Plate XII. Details of a Dormer Window with Casement Sash Opening Out.

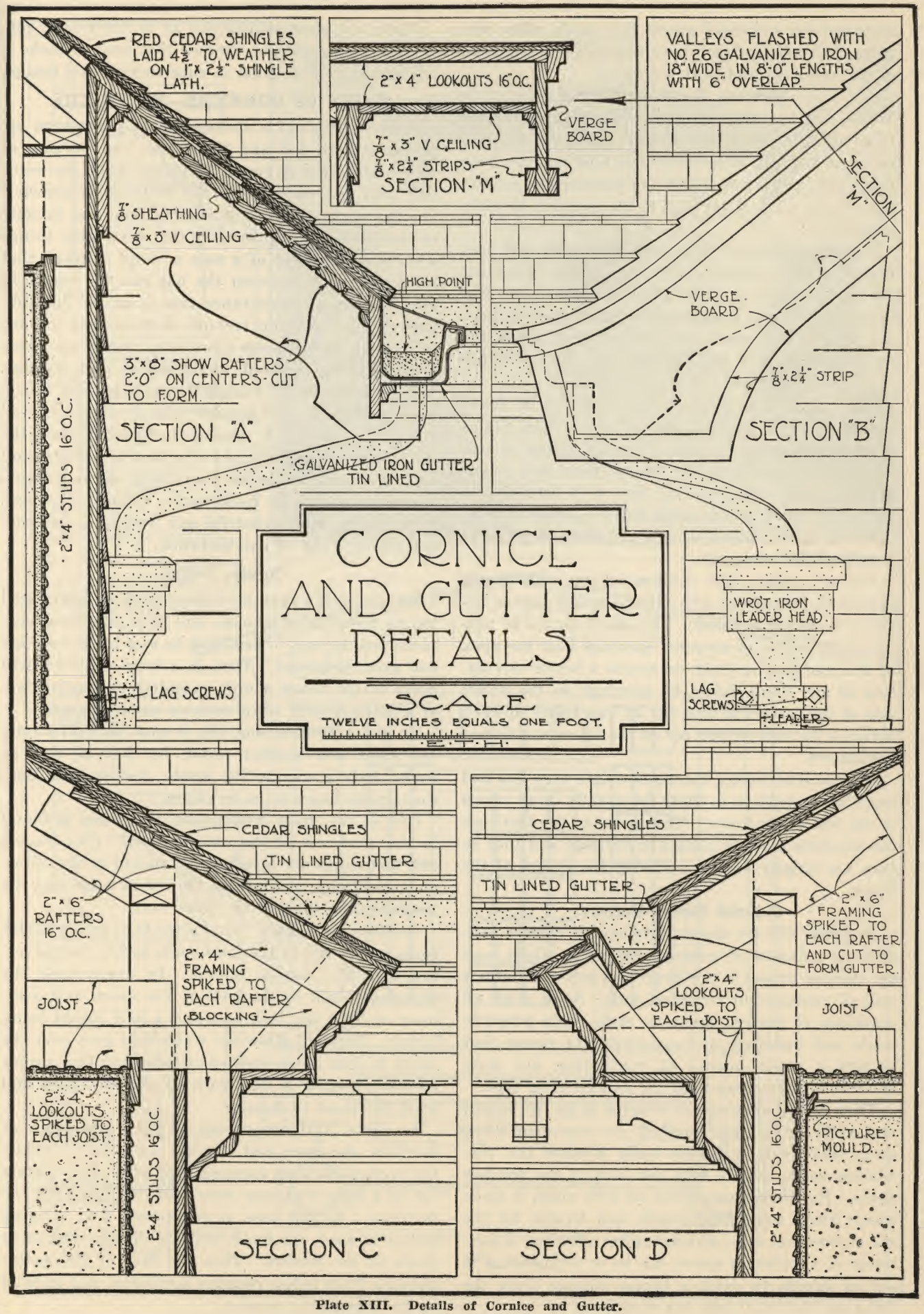


Plate XIII. Details of Cornice and Gutter.

expected but welcomed guests, and many other purposes that will tend to relieve the crowded condition of the basement and clothes closets.

Sleeping Room Problems.

The one big question that always arises in the mind of the owner when the subject of sleeping rooms in the attic is mentioned is, how can you keep them from getting so hot in the summer and cold in the winter? The latter part of the question is easily answered.

The rooms should have plastered walls and ceilings and heat introduced by registers or radiators the same as on the main floors of the house. For sleeping rooms, it is not required that they be kept the same temperature as a living room unless the room or rooms are to be rented and used as living rooms as well as bed rooms.

Referring to the first question, there is no doubt but that in the greater part of the United States our summer climate makes the attic rooms almost unbearable, and even the second floor bed rooms get their share of the heat. But with foresight in the construction of the house and the proper installation of a few features, this objection may be at least partially removed.

Where possible, the ceilings of the attic rooms should be furred down to allow for some space between them and the roof. This space should be ventilated by means of screened openings near the apex of the roof and in order to secure a better circulation of air, there should be openings on the under side of the cornice so that the air can travel upward between the rafters and out at the above mentioned ventilators.

In most attic rooms, the windows are very few and small in comparison to those for equally large rooms in the rest of the house. This is due to the fact that the windows must be placed in dormers and they in turn are largely fixed for size by the design of the house.

Colonial Design Dormer.

In Plate XII are shown details of a dormer suitable for a house of colonial design, in which case the dormer proper is not large and accommodates a pair of casement or swinging sash. Aside from all questions of design, casement sash, when properly made and installed, and especially for rooms that require a great amount of ventilation, are more efficient in every way than the double hung type.

They permit opening the window to its full height and width, giving one hundred per cent ventilating area, while with a double hung window the ventilating space is only fifty per cent of the window space. For that reason alone an attic room is made many times more comfortable and livable by the use of casement sash, which, besides affording a maximum of ventilating space, can be so adjusted as to act as shields to catch a breeze coming from the sides and deflect it into the room.

Plate XII gives suggestions as to features in connection with a dormer window that tend to make it efficient as well as good in construction and design.

TYPES OF CORNICES—PLATE XIII.

A house without a cornice would present an appearance both sad and humorous; sad because of the trouble that is bound to follow when the rains find their way down inside the walls and begin their deadly work of disintegration; humorous because of that unfinished appearance that invariably brings a smile at the sight of a man without a collar, that connecting link between the hat and the coat. In other words, an appearance that is out of the ordinary or of something lacking; for we have become so used to seeing some kind of a cornice on every house that one without would indeed look strange.

A cornice, to be beautiful, need not be fancy, heavy, ornate, full of gigsaw work or deeply carved mouldings. We have passed that period when the scroll saw was in its height of senseless activity, and have now come to realize that the plain and simple cornices wrought by hand in the colonial days are, after all, the most beautiful and worthy of our consideration if not of our imitation.

Cornice Design.

Of course the type of cornice used is determined by the design of the house, and so it all comes back to the builder and to how well he uses his knowledge and good judgment. That, in a large measure, will make of the house a unit, complete and satisfying, or a patched quilt affair without name or reason.

To give a cornice long life, it must be built strong and tight and weather proof, for just as soon as water finds a way to the inside, just so soon does the cornice begin to go to pieces.

One of the great weaknesses, therefore, is found in the weakness of the cornice itself. The boards and mouldings are insufficiently nailed to the frame of the building, and in time they work loose and the weather soon finishes the job.

Another fault often found after the cornice begins to go to pieces is in the joint made by the roof covering and the cornice mould. In every case the shingles should be doubled at the eaves and overhang at least one inch, one and a half inches being better. This will allow the water that goes over the eaves to drip down instead of following the cornice mouldings until it can work in at some joint and start the wood to decay.

In Plate XIII are shown two distinct types of cornices, the open and the box. Section A shows the section thru an open cornice with show rafters cut to a form that may vary with the design of the building. In this case, a galvanized iron hanging gutter is used, tin lined, and the lining pitched to drain to the leaders. Thus the face of the gutter showing from below remains horizontal and parallel to the lines of the cornice.

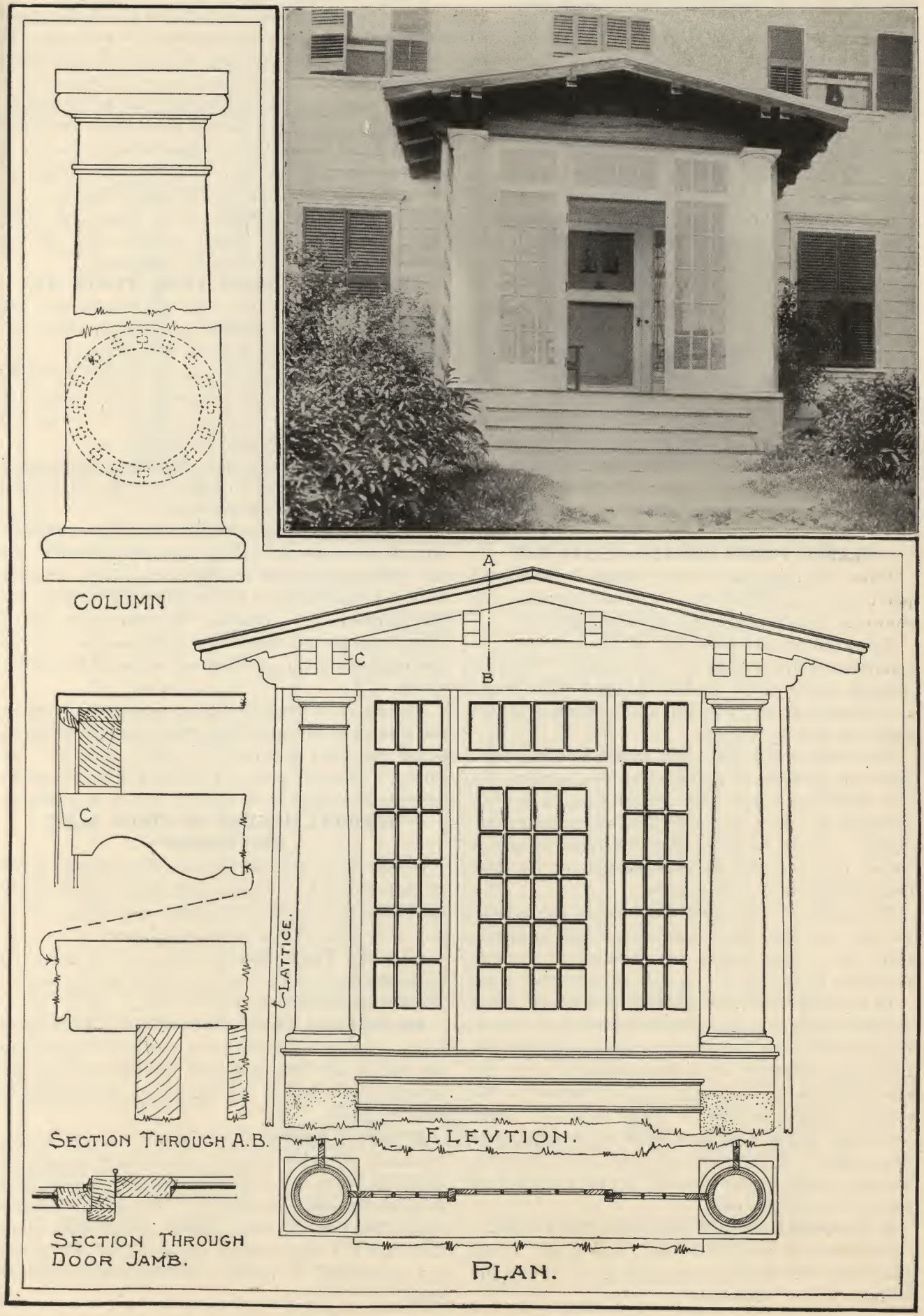


Plate XIV. Photo and Working Drawings of Well Designed Glazed or Screened Porch.

Verge Boards.

Section B shows the elevation of the verge-board which is used at the gable ends. Section M shows how it is built up and framed out from the building.

Sections C and D show box cornices, similar in design but with differently constructed gutters. Note that the tin lining in all cases is flashed well up under the shingles. This is the weak point and the one that should have the most careful attention. The gutters will fill up with snow and the following thaw will start the water seeking an outlet in every direction.

Also note in Plate XIII that the two gutters in sections C and D are V-shaped. This is an advantage in that the flow of water in the gutter is accelerated along the lower edge and causes a flushing action that keeps the gutter free from dirt that might in time clog it up.

These details, which show plainly the manner of construction, may be applied to plaster or brick walls as well as those of frame. Box cornices will always work better for steep pitched roofs, while the open cornices are better adapted for roofs of low pitch.

GLAZED PORCH DETAIL—PLATE XIV.

From the elevation of this design for a glazed porch can you picture the completed structure, as shown in the photographic reproduction?

Going back to the detail one of the first items encountered is the design of the columns. There is nothing on the detail to show the size. The design is conventional and possibly stock columns of the right size can be secured.

The cross section thru A-B, shown in Plate XIV, gives the method of constructing the cornice and this detail, with floor plan, would make it easy to ascertain the sizes and quantities of materials required. It will be noted that the cross section is shown in two parts, the continuation of the first being indicated by a dotted line.

The section "thru door jam" shows the side of the jam to which the door is hung. This is incomplete for a door stop is not indicated. Material should be supplied.

In planning screens or glazing for a porch where columns similar to those shown are used, it is well, if practicable, to include or exclude the columns from the enclosure. It is most difficult to fit the connecting material snugly to the contour of the column, and even tho a good joint be made, shrinkage of the wood may cause it to open and in that manner destroy the value of the enclosure, whether designed for warmth or as a protection against flies and insects.

A COLONIAL PORCH DETAIL—PLATE XV.

Extension of the rafters gives this porch a pergola effect that is not displeasing or out of keeping with its name, "Colonial."

Rafters, cross beams, the latter in two tiers, extend beyond the roof proper and are cut to pattern. The open lattice work on the sides is an additional ornamentation.

The porch is designed largely as an ornament. The appearance of the finished structure is excellent.

One detail which the estimator should observe is carefully to measure and tally the total height of the porch and to check that height or distance with that shown on the elevation of the house. A slight error in calculating would render some of the material supplied valueless for this work.

COLONIAL INTERIOR TRIM—PLATE XVI.

Details of an excellent type of Colonial trim are given in Plate XVI. This is an expensive trim, calling for a great deal of material and labor.

The detail drawings are not intricate nor difficult to understand. The finished product is massive in appearance and the style should be employed where the ceiling are unusually high.

Section J-K is of interest. Here the plinth block is clearly indicated and its size may be determined from this detail and the elevation.

The casing is furnished full width. The workman rips off at the second dotted line (from the left) for the distance shown on the elevation. The lip mould is then broken around this indentation with the result shown in the elevation. The plain and dotted lines immediately above the cross section of the casing show the lip moulding set on top of the plinth block.

Because of its form the casing must be mitered at the corners or notched, the former method, perhaps, being the most practical. It also must be "returned" where it joins the plinth block and allowances must be made to cover this loss of material.

OFFICIAL GRADES OF STOCK SASH AND DOORS.

It may be of interest in this connection to know the official grades of doors and sash, graded under rules adopted by the Sash Door and Blind Manufacturers' Association of the Northwest.

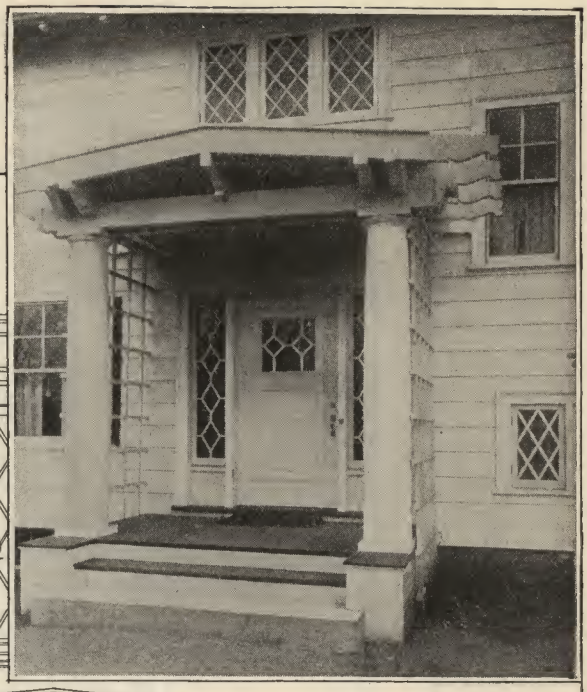
AAA Oil Finish Doors—Material for AAA oil finish doors must be clear, no white sap admitted. Workmanship must be good.

AA Oil Finish Doors—Material for AA oil finish doors must be clear, with the exception that white sap will be admitted, not to exceed twenty-five (25) percent of the face of any one piece. Workmanship must be good.

A or No. 1 Quality—Material in No. 1 doors must be clear, with the exception that water stains and small pin knots not exceeding one-fourth (¼) inch in diameter may be admitted. No piece to contain more than two (2) such defects and no door more than five (5) such defects on each side; white sap not considered a defect. Workmanship must be good.

PLATE XV, COLONIAL PORCH DETAILS

No style is more popular today for the best work than the Colonial. The old motifs are used with very often a refreshing addition of the new,—as the bungalow rafters on this Colonial porch. For a small front entrance or where the main entrance is on the side, this detail is admirable. The measured drawings are to a scale of ⅜ inch equals one foot.



MEASURED DETAILS OF A COLONIAL PORCH
⅜ INCH SCALE

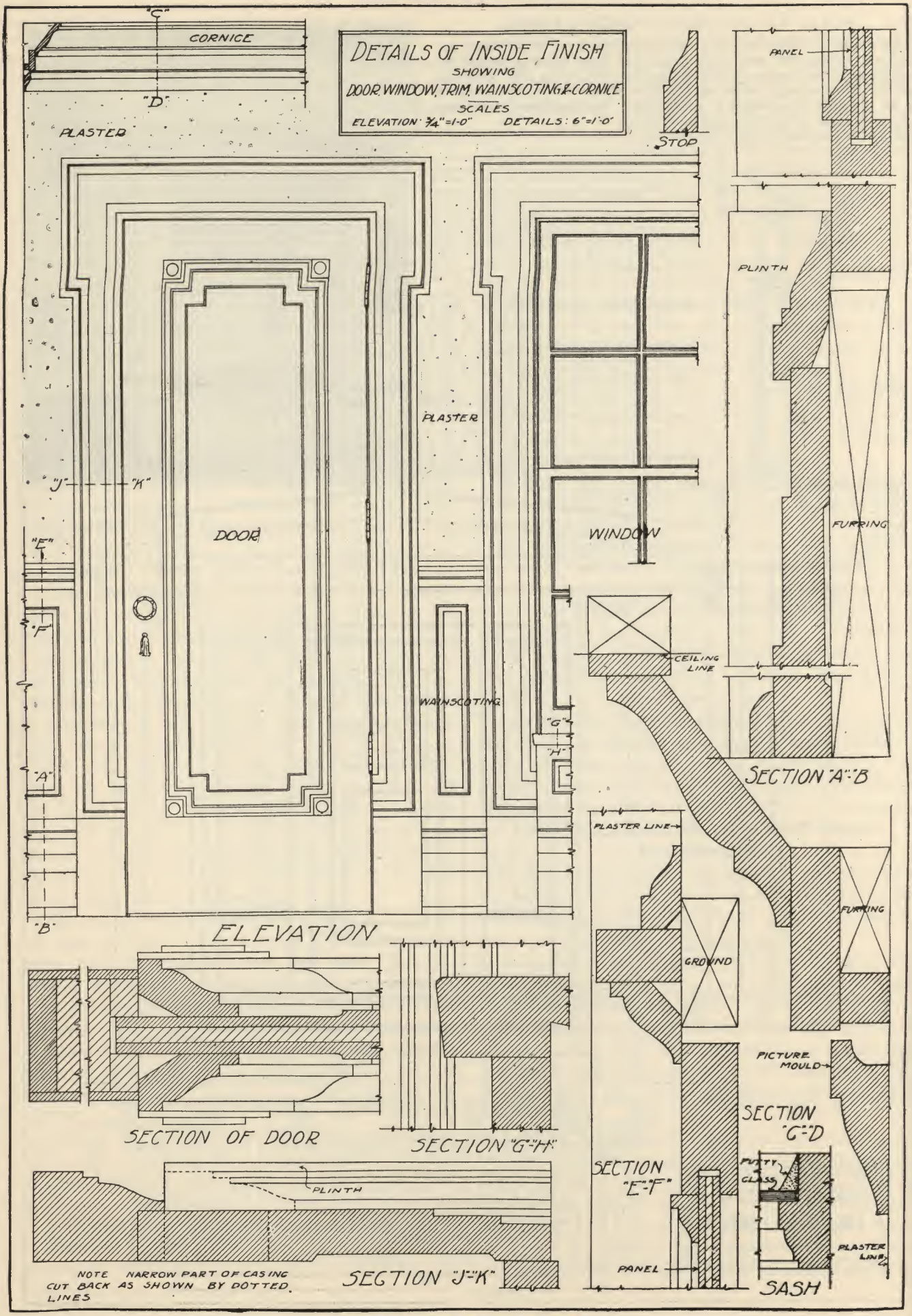


Plate XVI. Elaborate Colonial Trim.

B or No. 2 Quality—Material in No. 2 doors may contain knots not to exceed one (1) inch in diameter, and blue sap showing on both sides not to exceed fifty (50) percent in any one piece of the door and gum spots showing on one (1) side of a piece only and other slight defects, shall not exceed ten (10) in number on each side; and each white pine stile, bottom and lock rail must contain at least one (1) and not to exceed three (3) such defects; plugs admitted and not regarded as a defect. Slight defects in workmanship admitted.

C or No. 3 Quality—Material for No. 3 doors may contain all stained sap and small worm holes and fine shake; also knots not exceeding one and three-fourths (1¾) inches in diameter. Twenty (20) defects may be allowed on each side, also slight defects in workmanship. Each piece of white pine in a No. 3 door must contain a defect. Not more than six (6) defects in any one piece.

No. 4 Quality—No. 4 doors are regarded as cull door and must contain large coarse knots and may contain rot, worm holes, shake and other serious defects.

Check Rail Windows may contain two (2) knots three-eighths (⅜) inch in diameter, or one red knot five-eighths (⅝) inch in diameter in each piece of a window. White sap and not over thirty-three and one-third (33⅓) percent blue sap may be admitted in any one window. Workmanship must be good.

Plain rail windows and sash may contain blue sap and small knots.

VALUES OF WOODS FOR TRIM.

All the finished woodwork which is an integral part of a building and which is put up after the building is plastered, is generally included under the heading of "interior trim." This may be divided into "standing trim," including all that is affixed to the walls, as casings, baseboards, wainscoting, beams, cornices, etc., and "fittings," which include cases, cupboards, drawers, shelves, etc.

As the primary object of the standing trim is to cover up the rough work and make a finish where the plaster joins the frames, or else to protect the plaster walls, an ornamental appearance is the chief requirement of the work; and to this end smooth surfaces—free from knots, sap or other defects—close joints and freedom from warping and shrinking are necessary, rather than strength and durability.

The character and quality, and usually the cost of the inside trim depends greatly upon whether it is to be soft or hard wood, and whether it is to be painted or varnished. The soft woods are commercially classified as those belonging to the conifers, while the hard wood come from the broad-leaved trees. Carpenters, however, usually classify whitewood (poplar), redwood and cypress as soft woods, while hard pine is frequently, but incorrectly, called a hard wood.

For trim of any kind the soft woods are always cheaper than hardwoods, even when the price of the lumber is the same. This is principally for the reason that the soft woods (and here we include redwood and cypress) can be used in the solid for making doors, sash, etc.; the greater ease with which these woods can be worked also effects the price, altho not to a very great extent.

Painted Trim Woods.

Painted work also costs, as a rule, less than varnished work, for the reason that cheaper grades of lumber may be used, and the same care is usually not exercised in putting it up and keeping it clean.

The first consideration for a trim wood that is to be painted is that it shall stand well, and next to this come freedom from knots and pitch, and then low cost. These conditions are most fully found in white pine, and whitewood (poplar). The latter is extensively used in some localities, particularly for carved work, columns and mantels and for shelving, etc., as it can be obtained in large dimensions and remarkably free from knots: its softness and uniform grain makes it also well adapted for carving that is to be painted. This wood, however, does not stand wear as well as pine. In a great many localities hard pine is cheaper than white pine, but it contains too much pitch to take paint well.

Natural Finish Trim Woods.

For interior work that is to be stained or finished, the color or grain of the wood most influences the selection when the cost is not a controlling feature.

Its hardness also is a very important quality, as the softer woods mar and get dented easily. It is for this reason that soft pine, whitewood, redwood and cypress are inferior to oak, ash, beech or maple, altho otherwise they make a very attractive finish when properly treated. Redwood, moreover, is very brittle, and the edges break easily.

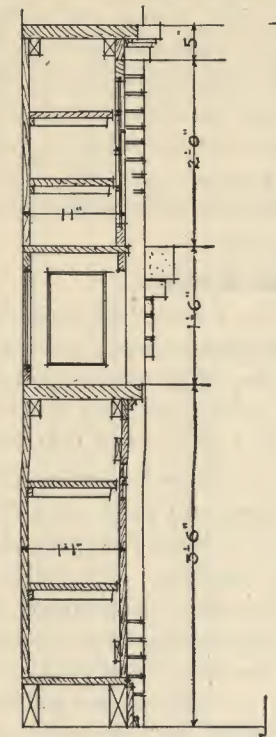
The various woods used for trim rank as to cost, in about the following order, commencing with the cheapest, the relative cost varying somewhat with the locality: hard pine, whitewood, cypress, redwood, clear white pine, ash, chestnut, butternut, red oak, white oak, beech, birch, maple, bird's-eye maple, cherry, mahogany and walnut.

Aside from the cost, the last eight woods are usually considered the handsomest, and most desirable, altho for certain rooms the other woods are nearly, if not equally, as well adapted.

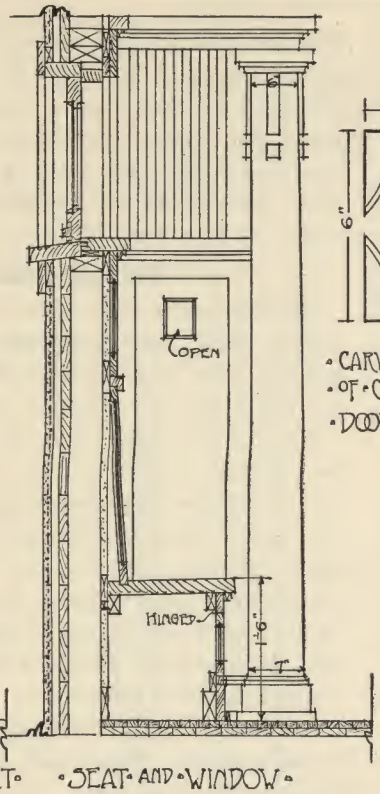
All woods should always be kiln-dried just before they are sent to the building, but it is not the custom in some localities to kiln-dry woods that are to be painted.

LIVING ROOM DETAIL SHEET—PLATE XVII.

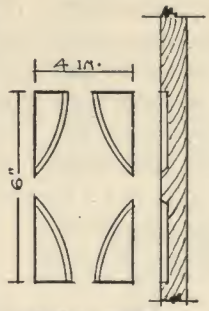
It is seldom the lumber dealer is called upon to estimate the cost of special fittings and built in furniture for a structure. When the plans call for special work of this character usually they are



SECTION THRU BOOKCASE AND CABINET

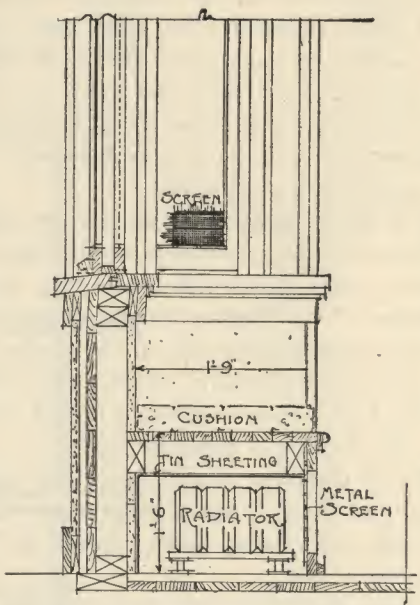


SEAT AND WINDOW

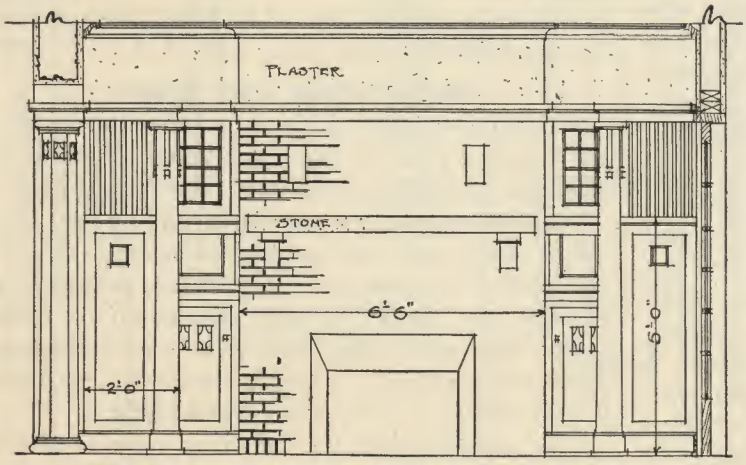


CARVED PANEL OF CUPBOARD DOORS

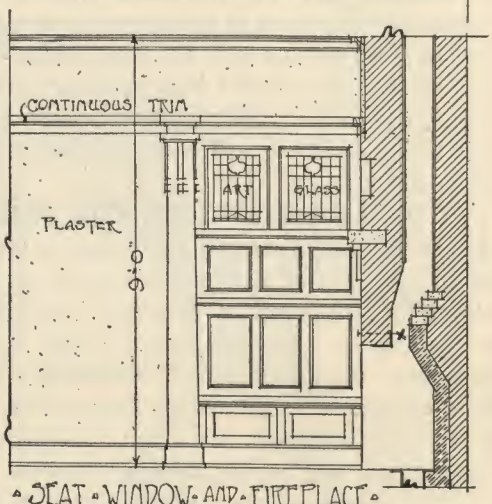
SCALE OF SECTIONS
½ INCH = ONE FOOT



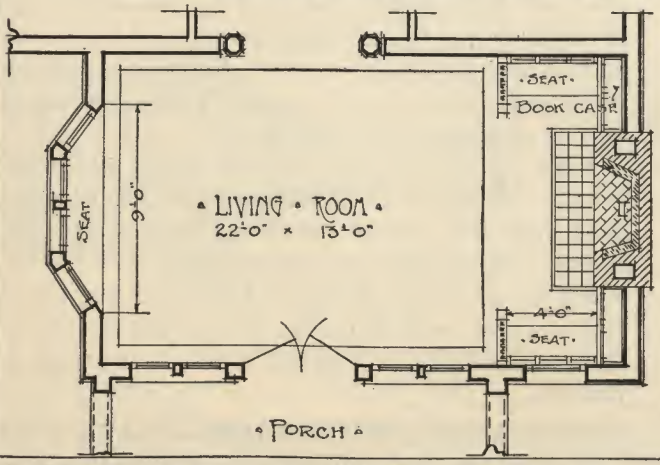
SECTION THRU DAY WINDOW SEAT



SEATS BOOKCASE AND FIRE PLACE AT END OF ROOM



SEAT WINDOW AND FIRE PLACE
SCALE: ¼ IN. = ONE FT.



PERSPECTIVE OF FIRE-PLACE NOOK

HOUSE INTERIORS — A LIVING ROOM

Plate XVII. Practical Suggestions for Those Who Prepare Plans.

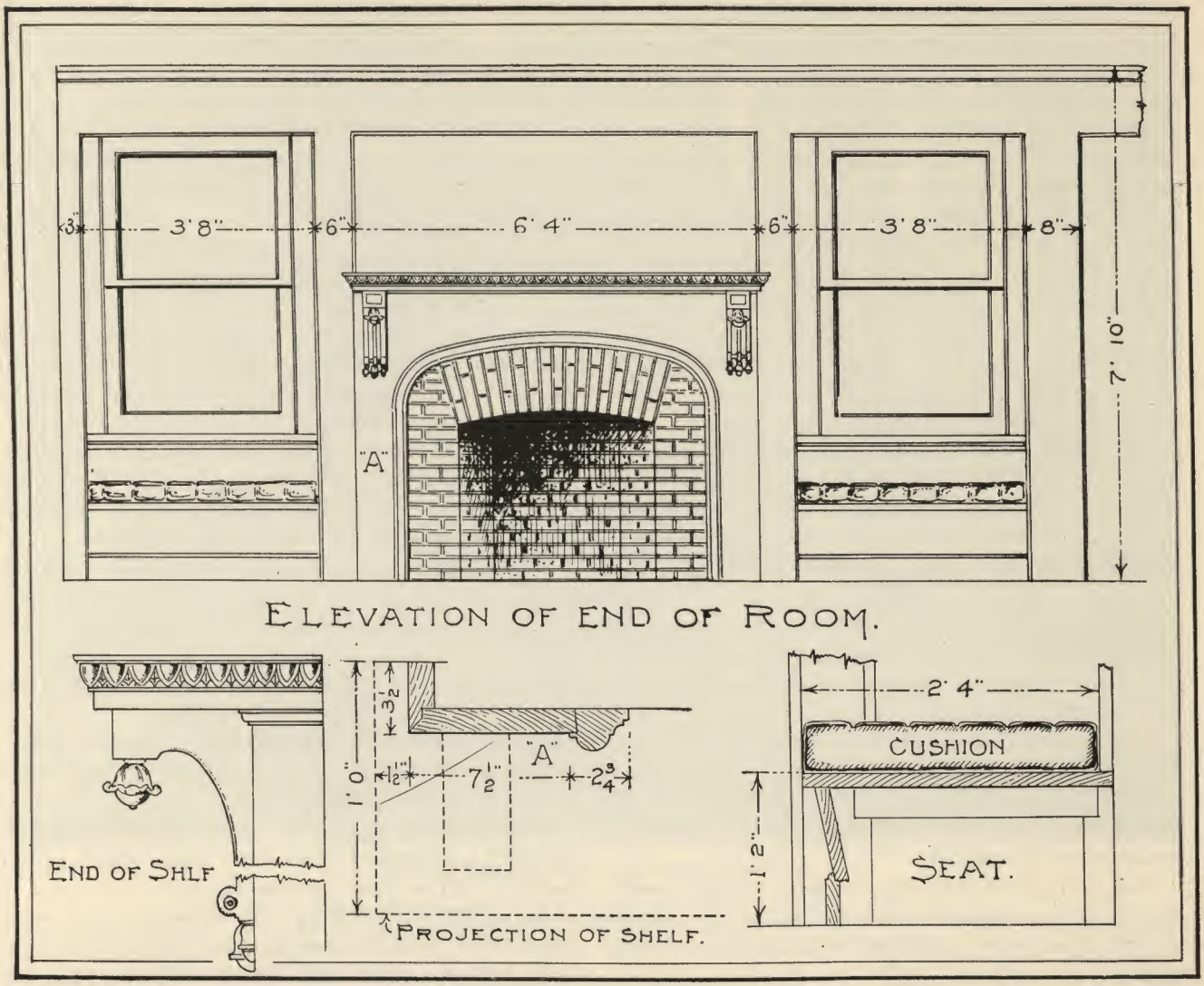


Plate XVIII. Photo and Dimensioned Drawings of Fireplace with Built-in Window Seats.

turned over to a planing mill operator who has his own methods of determining what the fixtures are worth, delivered on the job ready for installation.

A study of detail of this character, however, is instructive. A floor plan of the room is shown. It will be noted that this calls for bookcases, seats, panel work, art glass doors, a brick and stone fireplace and mantel, bay window, with seat and, of course the usual trim.

It is possible to take off a bill of materials from the details given, but hand cabinet work on this scale is very expensive. Therefore, as suggested, it is well to turn this phase of the work over to those equipped to furnish exactly what is required.

One value of this detail is to furnish ideas for dealer or contractor to suggest to their customers when the building idea begins to sprout or a change of plans or fittings comes up for consideration.

FIREPLACE END OF LIVING ROOM—PLATE XVIII.

In Plate XVIII is given an attractive design for fitting up the fireplace end of a living room. This gets away from the fireplace nook idea, shown to such excellent advantage in Plate XVII, and makes use of the window seat as a means of utilizing the corners between fireplace and walls.

This design is built along the lines of severe simplicity, the only departure being the moulding and brackets on the mantel.

The photograph introduced shows a slight modification of the original design and makes the mantel a trifle ornate when compared with the style of trim used.

This, also, is a feature of the house bill that the planing mill operator will be glad to handle and which, usually, is conceded to belong to him.

A FIELD STONE FIREPLACE—PLATE XIX.

It is somewhat difficult to visualize an entire house from a cross section or a photograph of one of its attractive features.

In Plate XIX is given a design for a rather unusual fireplace built of field stone and designed to become the feature of a large living room. It would be out of place in a small one.

Tile, stone and firebrick enter into the construction of the fireplace, with face brick for the chimney. The balcony around the latter, the exposed timbers of the roof, the heavy rack for the firewood, the open stairs speak for artistic results and call for care and skill on the part of the workmen and likewise for a wise selection of materials.

The information given on the detail is insufficient to enable the material man to arrive at an absolute understanding of just what will be required. Frequently, however, the contractor or the dealer has a photograph laid before him with a request for information on "What will it cost me to build one exactly like that," and the "one" may be a fireplace, a home, a barn or a trellis. In such cases you must take what you can get from the plan and supply that which is not given or indicated.

ANOTHER FIREPLACE NOOK—PLATE XX.

Plate XX gives important details of a well planned Elizabethan fireplace nook. The fireplace is built in the interior of the house, and carriers an opening for the furnace as well as for the smoke from the fireplace, which is an evidence of economy on the part of the architect.

It will be noted that the seats are thrown out in the room so the occupants will receive the benefit of the heat from the grate and that this result is accomplished without apparent effort.

The inside corner of the outer wall makes a corresponding offset necessary on the kitchen side. Dimensions for the hearth are given and sufficient detail to insure the brick going in properly.

The method of determining the segment over the cased openings is cleverly indicated and makes for accuracy in that, architecturally, very important detail.

Do not pass this up as another job for the planing mill man before giving it careful study.

A BAY-WINDOW SIDEBOARD—PLATE XXI.

Tastes differ, hence we do not all live in houses designed exactly alike.

Some women would not countenance the idea of building a sideboard in an outer wall, others prefer to have sideboard or buffet so located.

A method of handling the corner dining room where it is almost essential that the sideboard be built into the outer wall is illustrated to good advantage in Plate XXI.

In this case the sideboard is set into the bay window and the recess effect heightened by putting china cabinets at either side.

The call for woodwork for this room is rather heavy. The multiple window opposite the cased opening, the panel effects into which the plastering below plate rail is divided and the ceiling strips, with the usual trim added, call for considerable work both in estimating and installing.

A COMMON-SENSE CHINA CABINET—PLATE XXII.

Show the average woman a set of house plans and she will condescend to give the parlor and sitting room and entrance hall and all the rest of the front of the house just a casual passing glance, and then will settle down in real earnest for a study of the kitchen arrangement.

Usually, too (let's be honest about it), the kitchen and pantry don't suit her at all. She finds all kinds of fault with them, and insinuates sharply that they were evidently drawn up by some man who didn't know anything about housekeeping or what is needed in the working end of a modern family domicile.

Interior, Showing Huge Field Stone Fireplace.

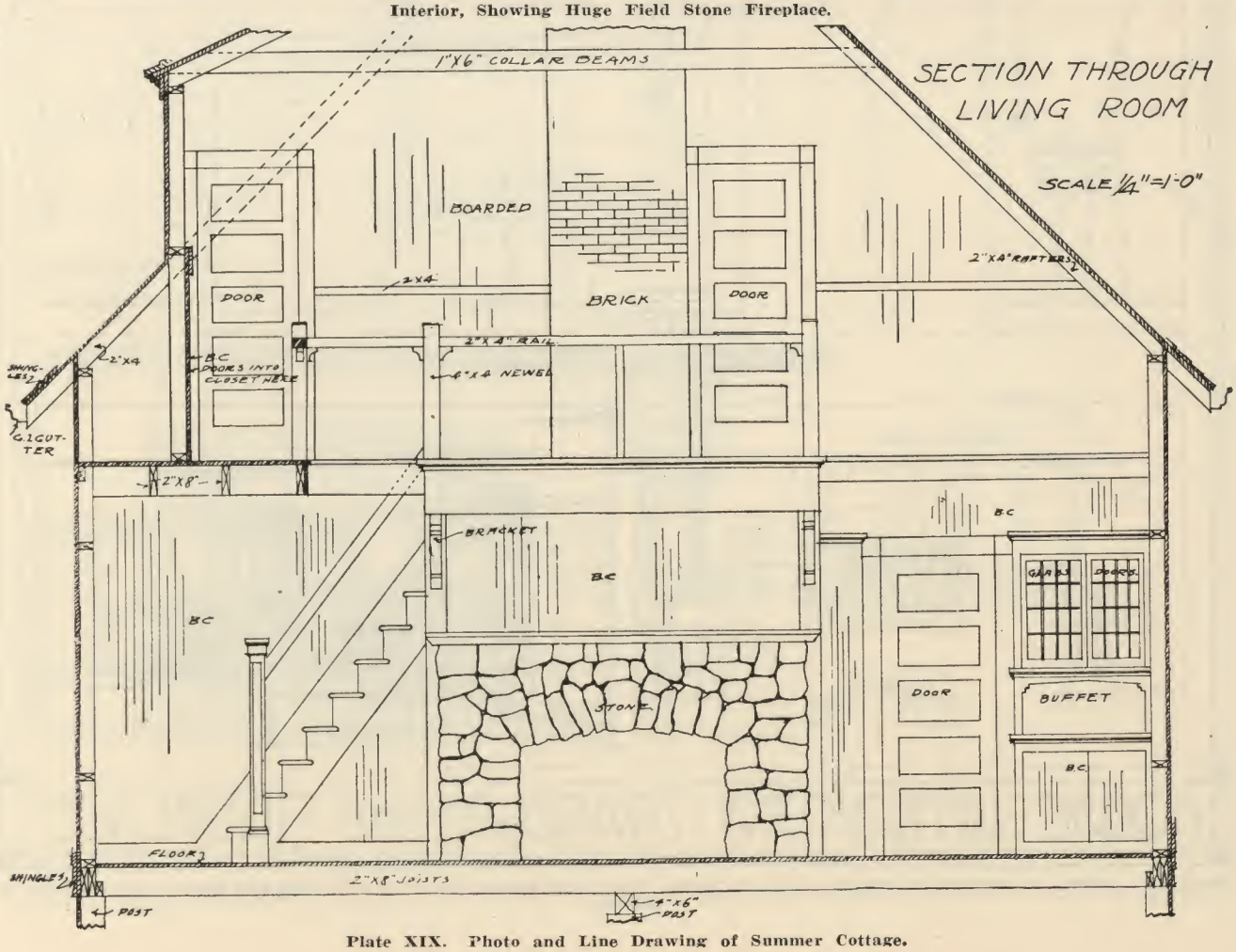
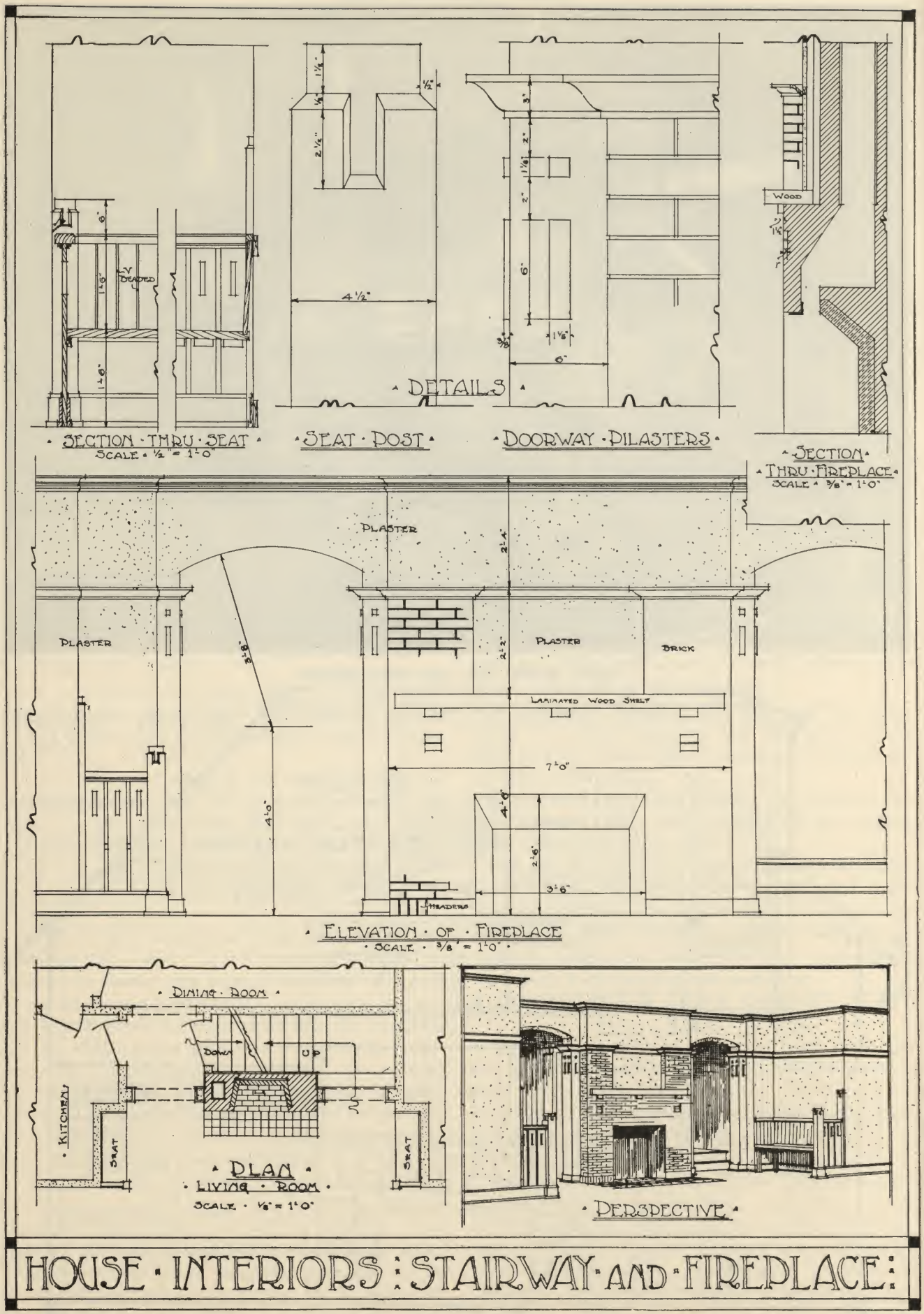


Plate XIX. Photo and Line Drawing of Summer Cottage.



HOUSE · INTERIORS : STAIRWAY · AND · FIREPLACE

Plate XX. Details of Elizabethan Fireplace Nook in Living Room, with Built-in Seats on Each Side and Stairs Going up Back of Chimney.

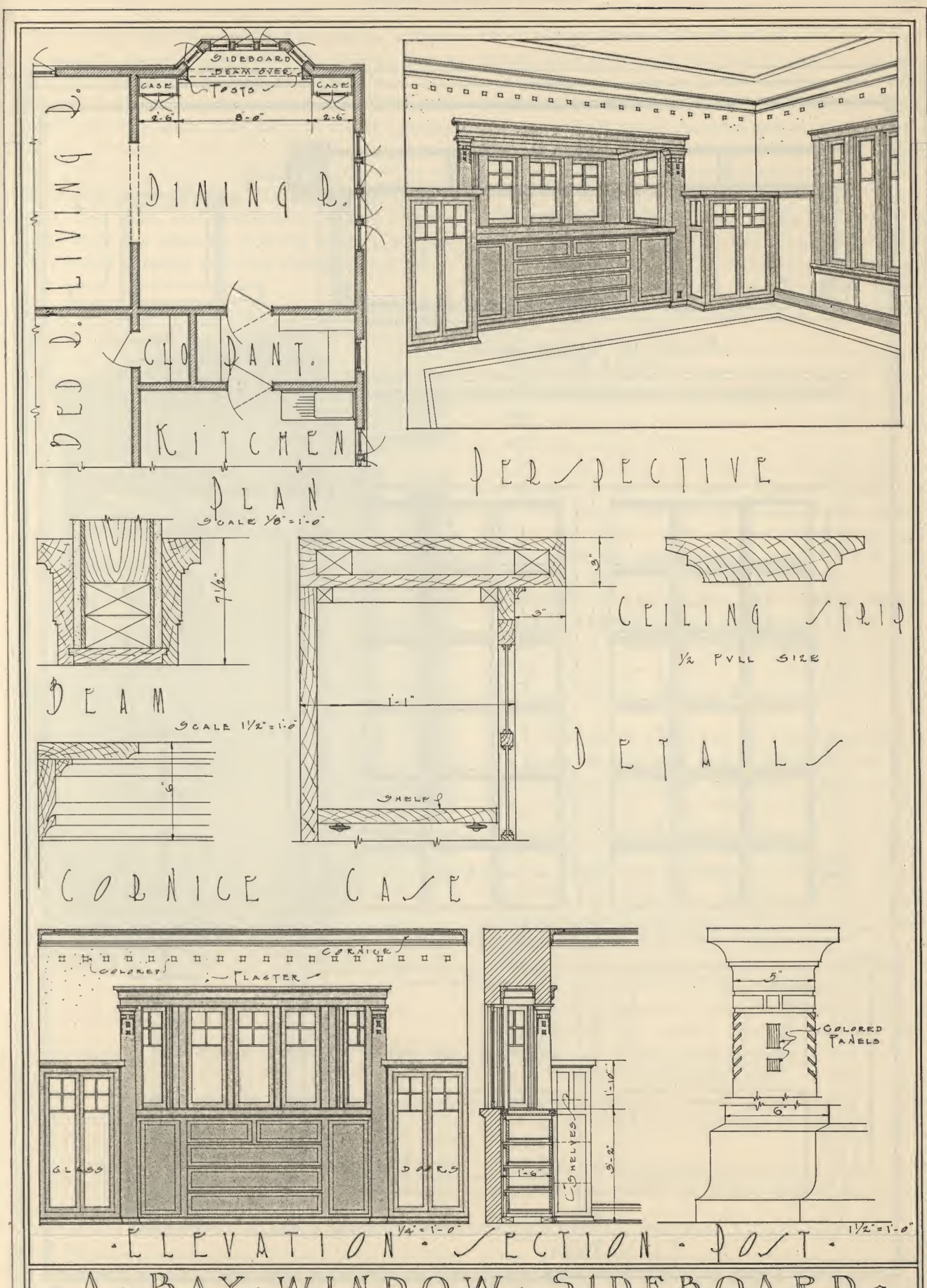


Plate XXI. Perspective Sketch, Plan, Elevation and Construction Details of Special Bay Window Sideboard for a Corner Dining Room.

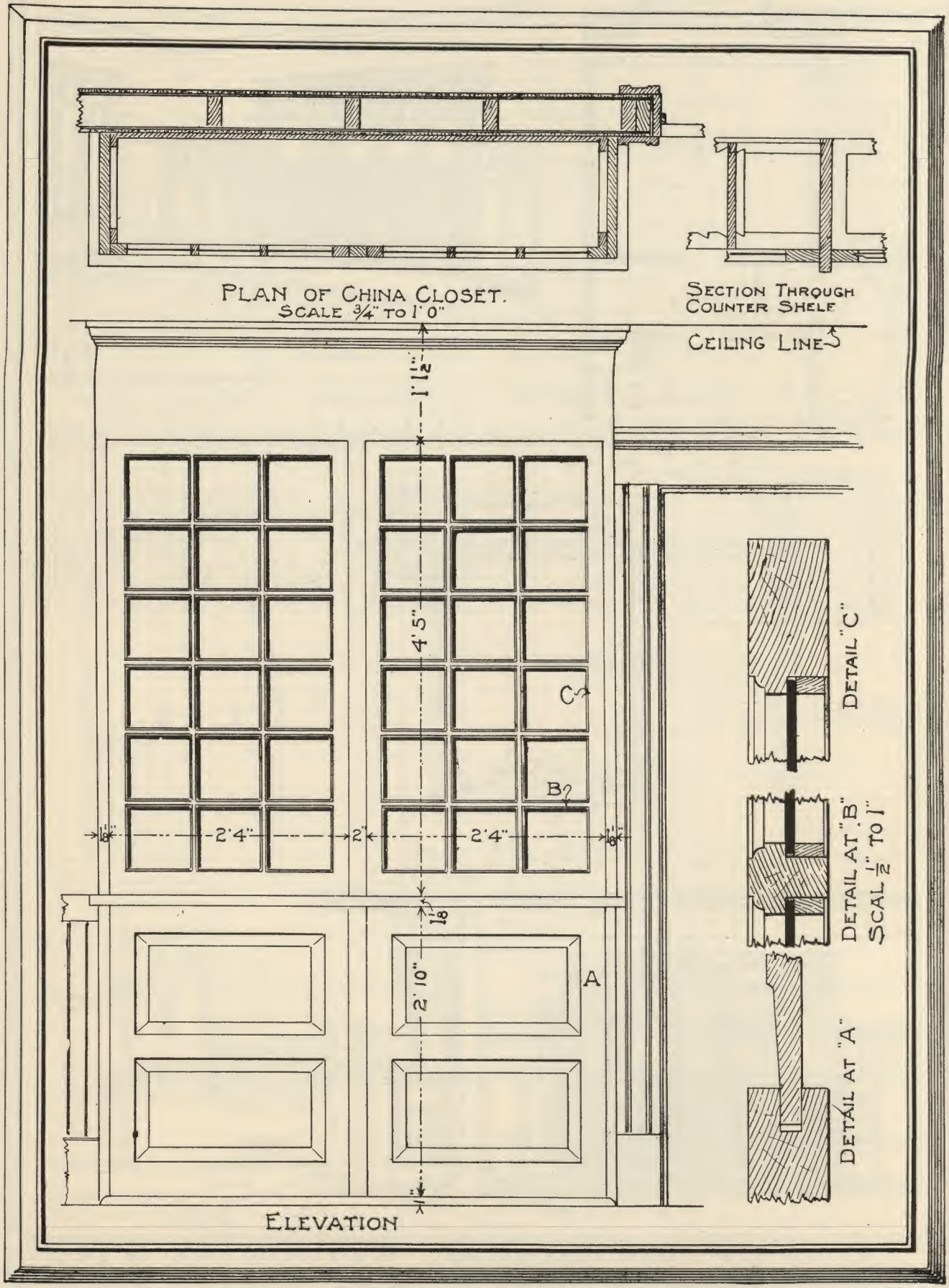


Plate XXII. Detail Drawings of China Closet Shown on Opposite Page.

Like as not Mrs. Housewife has modern notions and doesn't want any pantry at all. Wants just a big built-in cupboard or kitchen cabinet.

Humor her, let her have what she wants. It doesn't cost any more, and you can use the pantry space to advantage somewhere else.

But even when there is wanted a pantry of the old fashioned kind and size, an attractive china closet—roomy, dust tight, and unobtrusive, will be wanted. Maybe there is a place for it in the kitchen, perhaps in the butler's pantry or in the dining room itself.

View of finished china closet.

A china closet of the design illustrated here is sure to please. It is conservative, nice appearing, but not overdone. Its cost would be reasonable.

The closet illustrated was built out into the room, projecting its full width. Evidently it was added after the partition was built. If the builder knows just where the china closet is to be wanted, he can very easily frame his partition to make room for fully half the width of the closet inside the partition wall. This saves some space. It used to be the thing to build a china closet this way and have it open from both sides; not a very practical arrangement, however, as experience has proved. Many pieces of china and glassware like to be stood on edge as they should have solid back paneling to lean up against.

Whatever else you do in the building of a china cupboard, see that it is sealed in tightly at bottom and top and all round the sides and across the back. Make it mouseproof and dustproof, if there is such a thing possible in carpentry construction.

A Way to Discourage Mice.

A good little trick for discouraging the mice is to build the shelves in the lower case clear back solid against the rear wall. Loose shelves permit the small rodents to climb up behind from one shelf to the next. It costs only a moment's time to fasten the shelves solidly in place.

One kitchen china cupboard, we saw recently, was designed very similar to this. And it had an extension shelf (a narrow one) placed just below the bottom board of the upper case—a very handy place to set dishes temporarily.

This design might well be termed Miss Simplicity, for it may be read with ease. Taste or preference may vary with respect to the glazing for the doors. Usually the height of the shelves regulate the size of the glass, the two being so arranged that the cross muntons hide the edge of the shelves.

COMBINED COLONNADE AND CHINA CABINET—PLATES XXIII, XXIV AND XXV.

Many times it is not so much a matter of not having sufficient space enclosed as of not subdividing and employing the enclosed space to the very best advantage.

In Plates XXIII, XXIV and XXV are given details of a china cabinet built into a colonnade and virtually taking up no room whatever. The drawings given are complete. The idea is suitable for a five or six room bungalow, where space is at a premium.

The arrangement is a bit unusual but many builders are tired of the obvious and desire to get away from the beaten rut. Slightly rearranged and with doors opening into the living room, the china cabinet would make excellent bookcases.

One feature that will be noticed is the continuation of the top of the cases around the dining room in the form of a plate rail, with strips below to divide the plastering into panels. The dining room also has cornice and a picture moulding.

In the living room the head casing of the opening is made a continuous feature about the room. The height of all other openings should be lined up therewith.

Trim for both rooms should be made of the same kind of wood and they should be finished in exactly the same way.

The detail given is rather elaborate, but the detail given is necessary to produce working plans. The remainder of the trim and fittings for both rooms must be built to conform to this design, which constitutes the detail of one feature thereof.

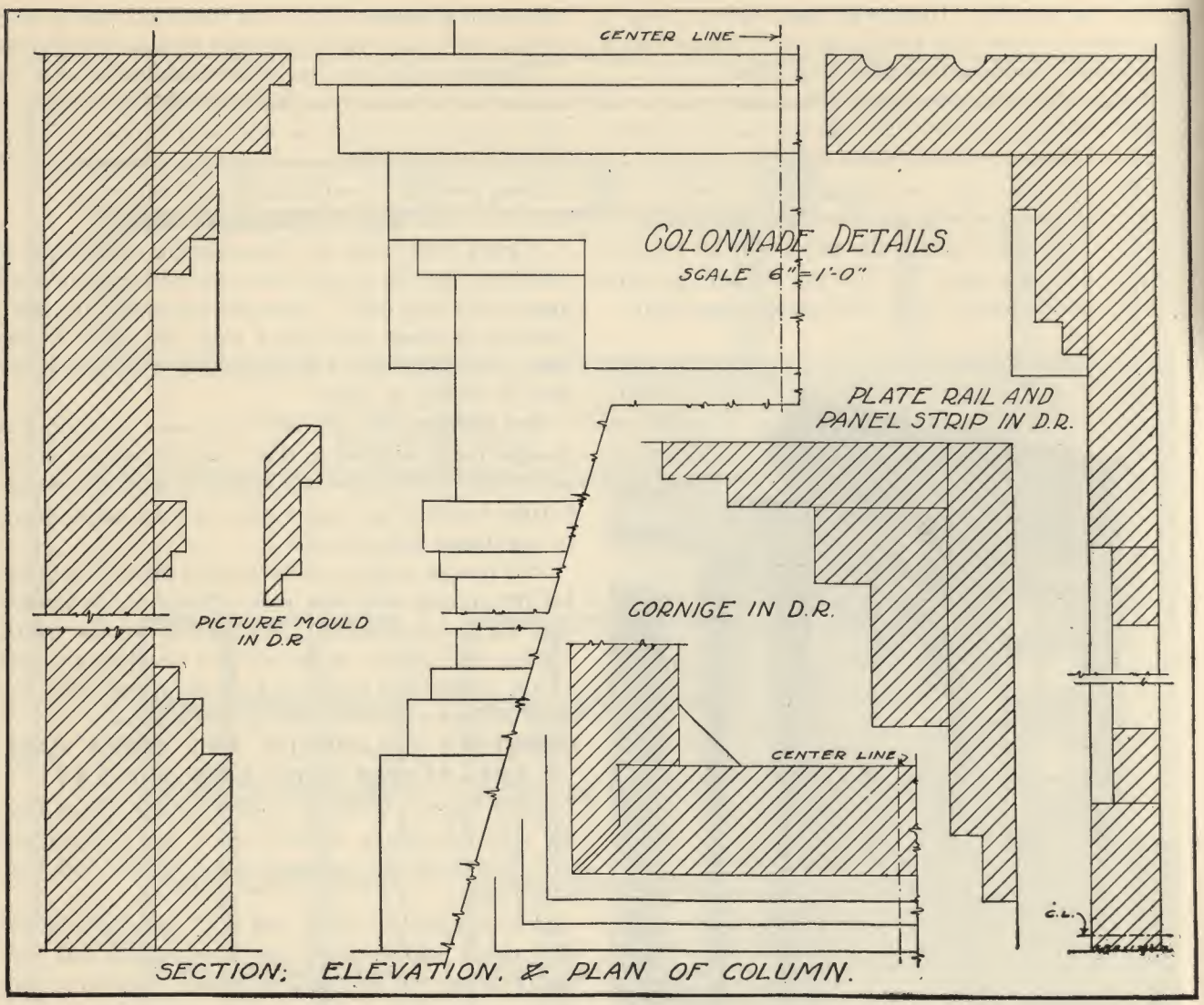


Plate XXIII—Larger details of colonnade construction.

AN OPEN STAIRWAY—PLATE XXVI.

The detailing of stairways is among the most important considerations in designing the interior of a house. In all the older houses, more attention was, perhaps, paid to the stairway than to any other one thing. Many houses built fifty years or so ago have simple woodwork with the exception of the stairs, which often are decorated with hand carved newels and balustrades. In these days it is very unusual to find stairways handled in that way; but that is no reason why they should be neglected.

The upper part of the detail in Plate XXVI shows a side elevation view and a section of the stairway. A pleasant feature is the simple open construction of the balustrade panels. The hand rail is supported by posts and the simple panels are placed between.

The panels in the walls are decorated with a single figure. A space 3½ inches by 5½ inches is divided up into nine rectangles. The four corner rectangles and the center are stained dark and the other four are left in the lighter color that is used on the rest of the woodwork. The panel is brought out clearly by the beveled groove that is cut around the entire figure.

In the center of the sheet is the design for the newel post. This is decorated in such a way that it is in keeping with the other parts of the stairway. A distinctive but not extreme design is used that helps to carry out the idea of dignity and quiet beauty.

The lower part of the sheet shows the general arrangement of the stairway and its appearance as seen from the living room. It also shows the position of the stair hall with regard to the dining room and the living room—an arrangement that makes for comfort and convenience in the use of the stairs.

It is not easy to plan or to build stairs that are pleasing to the eye and easy on the knees. The design shown is in good taste but requires sufficient hall room to show to the best advantage. The panel ornaments shown give that needed touch of the artistic that pleases without obtruding.

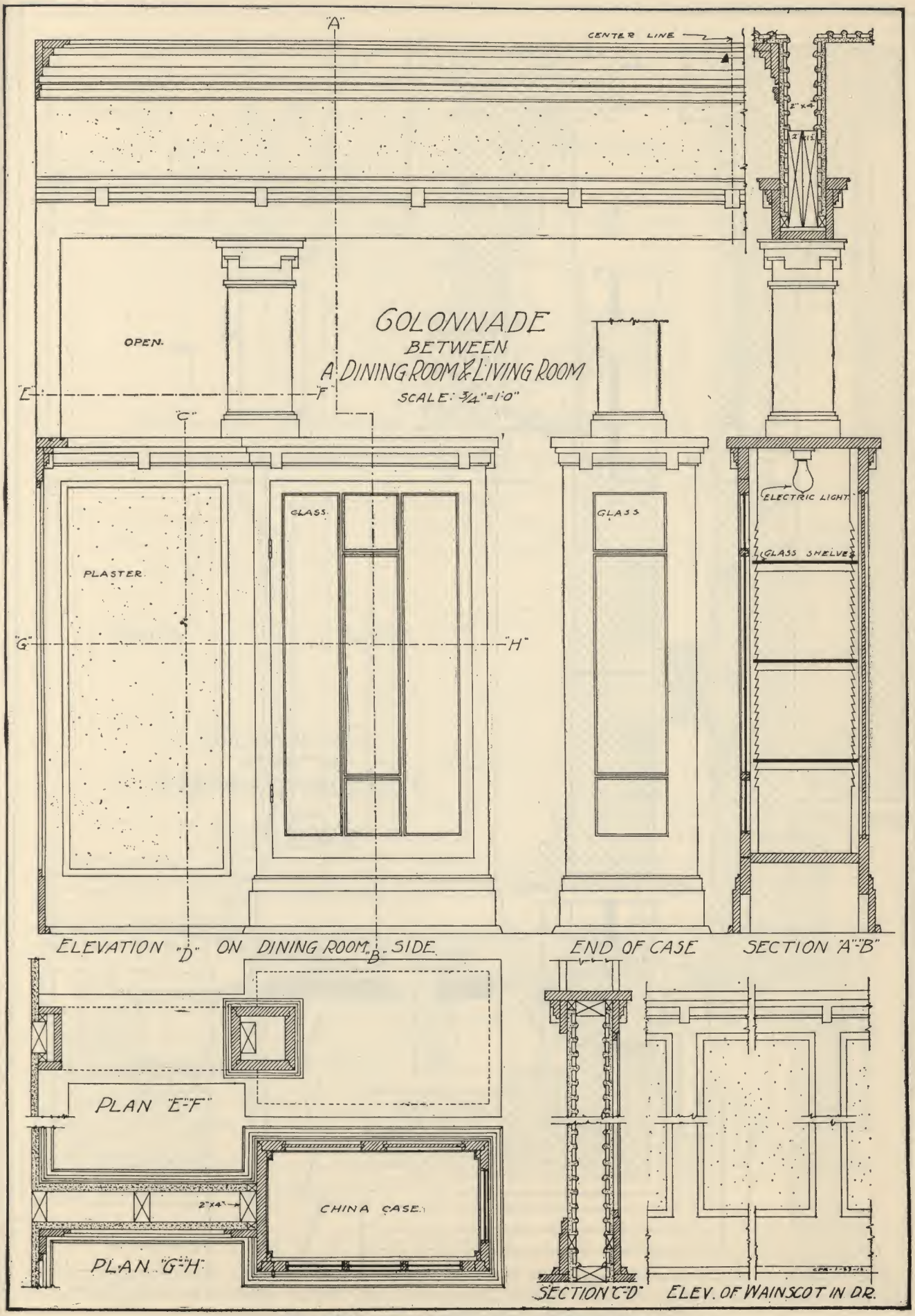


Plate XXIV. Combined Colonnade and China Closet.

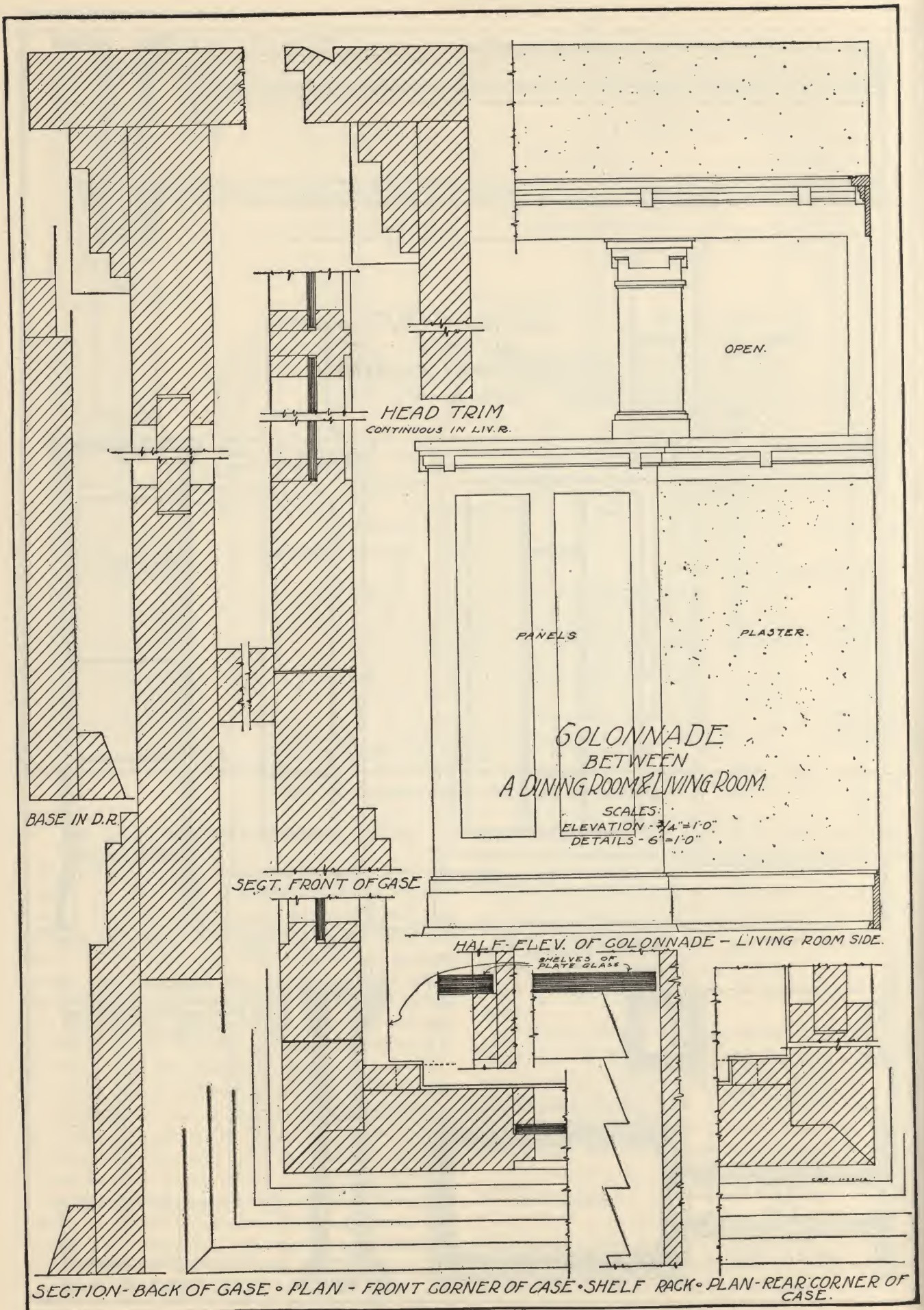
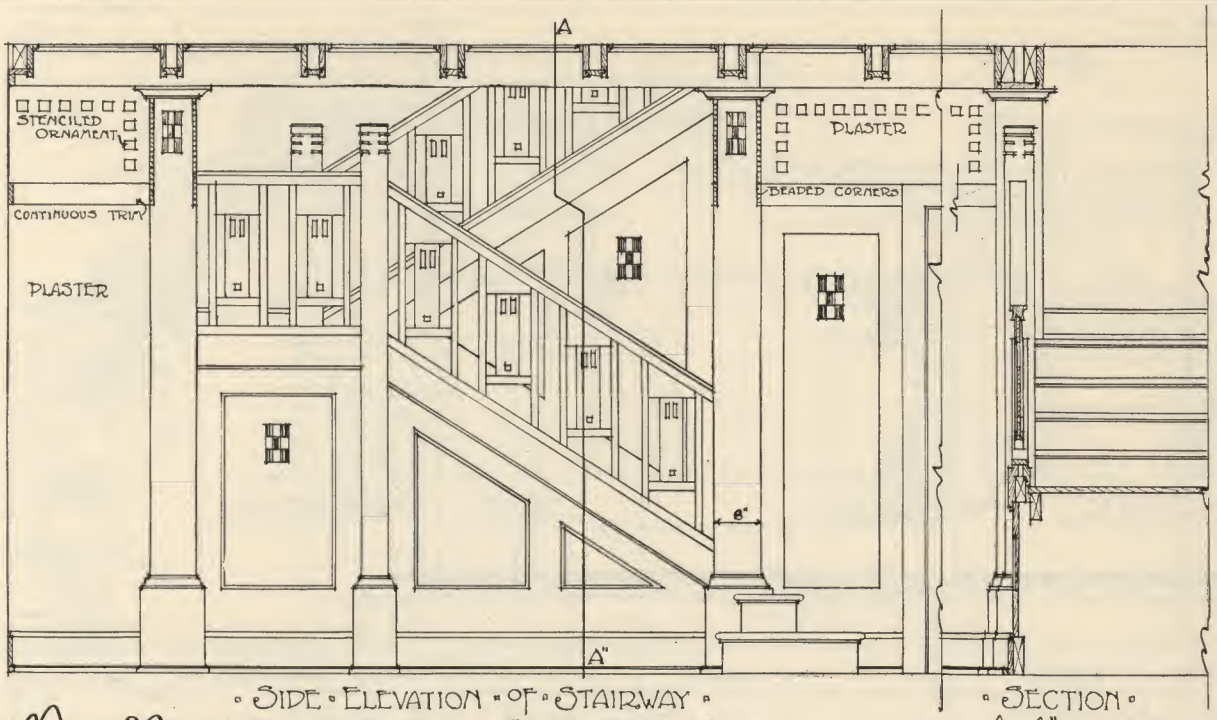
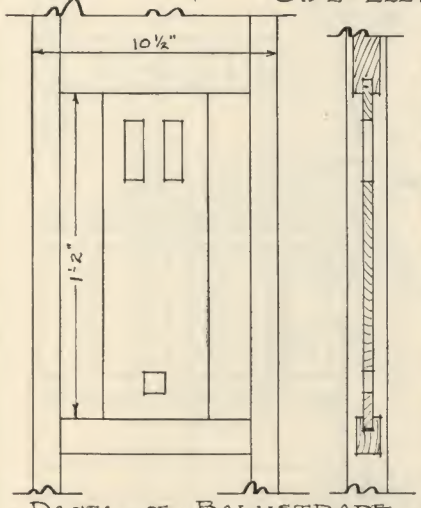


Plate XXV. Combined Colonnade and China Closet.

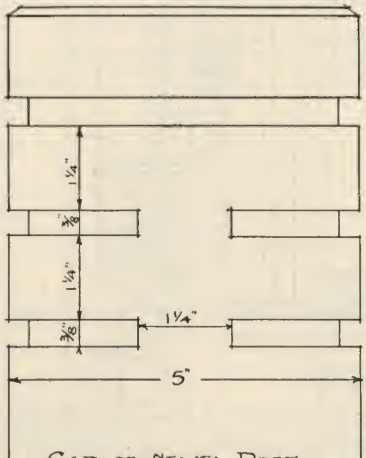


SIDE ELEVATION OF STAIRWAY
SCALE = 3/8 IN = 1 FOOT

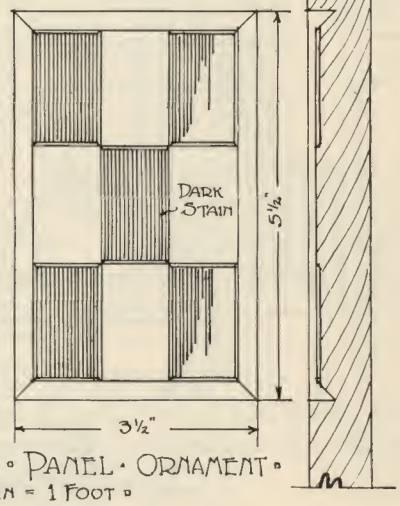
SECTION A-A"



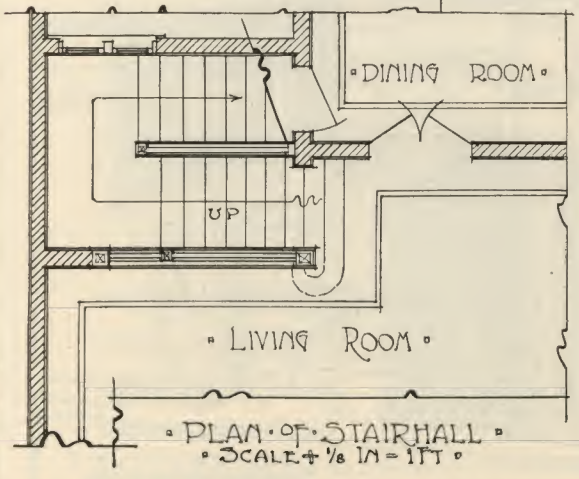
PANEL OF BALUSTRADE
SCALE = 1½ IN = 1 FT



CAP OF NEWEL-POST
SCALE = 8 IN = 1 FOOT



PANEL ORNAMENT



PLAN OF STAIRHALL
SCALE = ⅛ IN = 1FT

PERSPECTIVE

HOUSE INTERIORS--A STAIRWAY

Plate XXVI. Sketch Plan and Details of a Living Room Stairway.

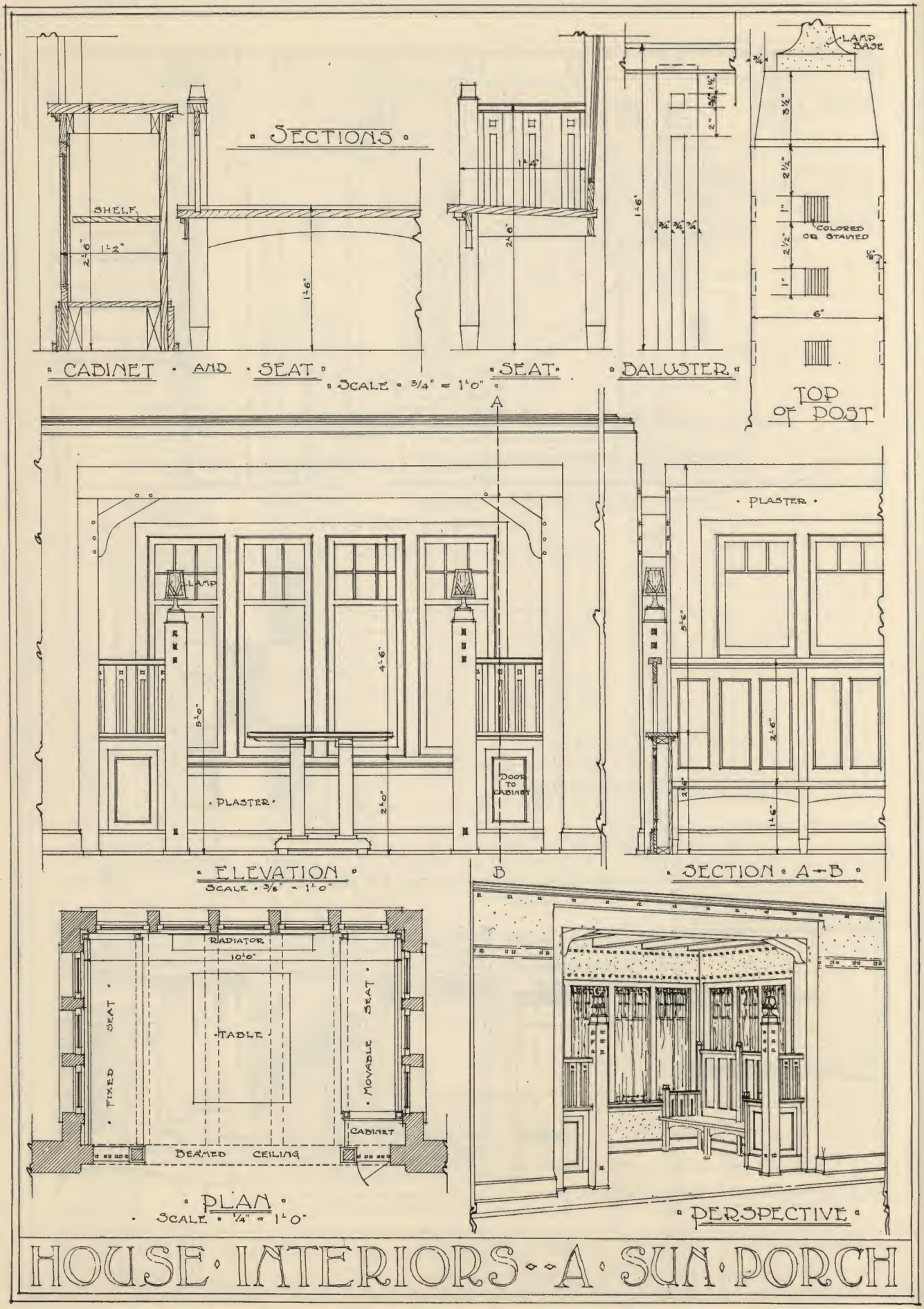


Plate XXVII. Details of Construction, Plans and Perspective View of Artistic Sun Porch.

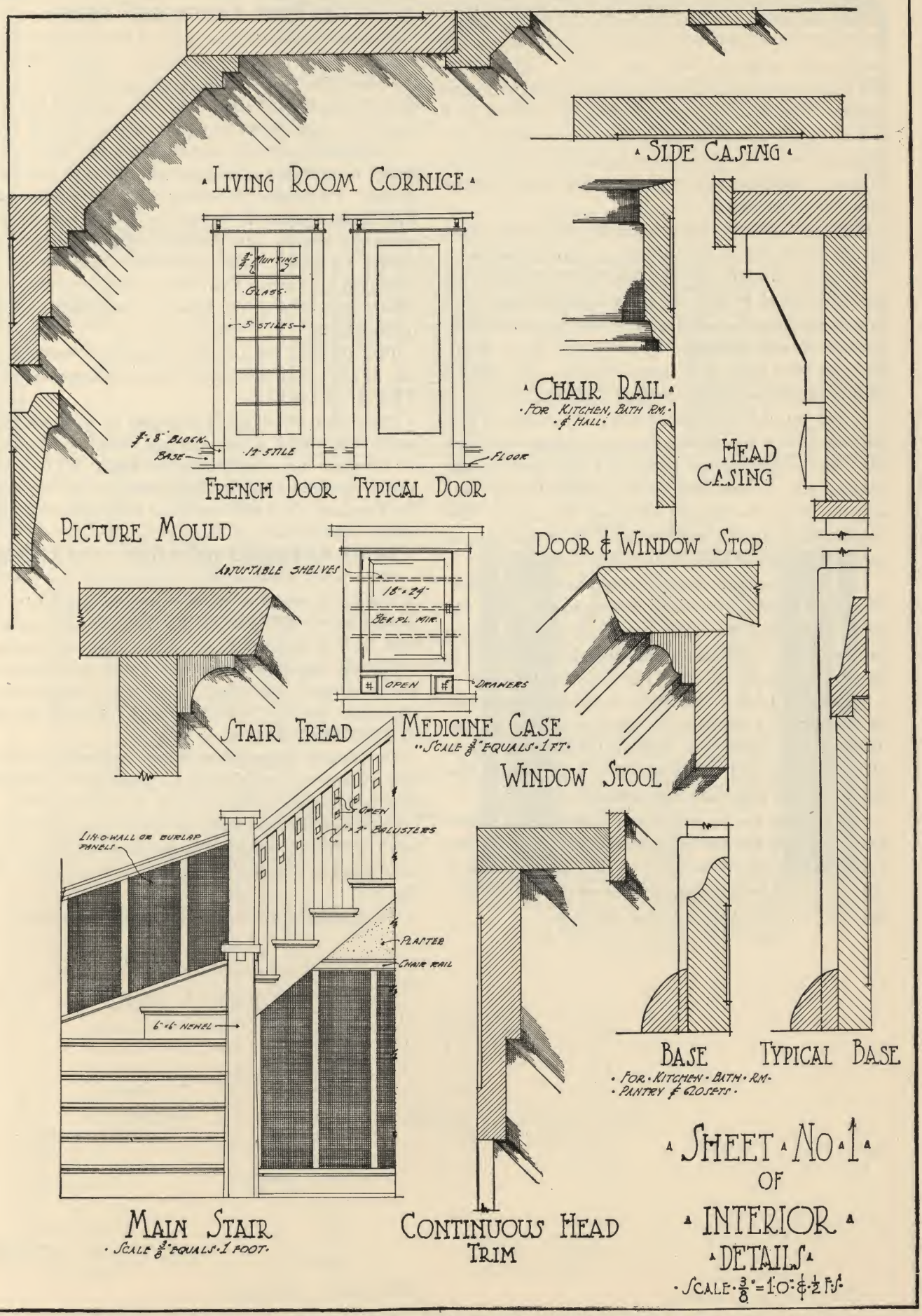


Plate XXVIII. Details of Interior Finish, to Scale for Modern Residence, Design No. 6636, Shown on Page 116.

DETAILS OF A SUN PARLOR—PLATE XXVII.

The sun porch has become more and more popular of recent years and now nearly all new homes are having sun porches built onto them. Also many old houses are being fixed up so as to provide a sun porch. This is often accomplished by making over a back porch or a detached room that is suitable for this purpose. The glass in the porch can be removed, in many instances, in the warm weather and screens inserted in its place.

The sun porch is likely to be the most used place in the house due to its cheerful, bright coziness.

In many designs the entrance to the porch from the other room is thru full-glazed double doors, but in this instance the separation from the rest of the house is merely indicated by two posts and a balustrade on each side of a cased opening. The details of this porch are shown on Plate XXVII.

Under one of the balustrades is a cabinet which will be handy for storing various things. In case the room adjoining the porch is a dining room, the cabinet may be used for china. If the living room adjoins, it can be utilized for books or games. The construction of the cabinet and the seats can be seen at the upper part of the detail sheet.

One of the seats is movable and the other is fixed. This will permit of a table being placed near the fixed bench and the other moved up to it. Breakfasts and other light meals can thus be served out in the sun parlor or open air porch.

Above the back of the seats on each side are windows which are divided into small panes at the top. The paneling on the seat combined with this gives an attractive paneled effect on the entire wall. The lamps on the posts are also artistic features.

Sun parlors are an added convenience and attraction. Many types are being constructed, but the one built for use twelve months in the year, similar to that here designed in detail, is the one that is returning full value for the sum invested in it.

INTERIOR TRIM FOR BRICK STRUCTURES—PLATES XXVIII AND XXIX.

Once upon a time it was asserted that "Pigs is Pigs," and the world paused a moment to laugh. Probably the assertion that "Trim is Trim" would bring a smile to the lips of those who have studied the question and cause others to pause long enough to think.

Consider all interior woodwork in the light of that which beautifies and adorns and you will not go far wrong. Of course, it serves other useful purposes. For these reasons it cannot be urged too strongly upon the builder that designs suitable to the room should be used. "Just anything" will not answer this need any better than will a labored striving for effect, especially if the labor of the effort is visible in the result.

Two designs for interior woodwork suitable for use in houses of moderate size are shown in plates XXVIII and XXIX.

Particular attention is directed to the rich effect secured by using simple designs shown in the detail of fireplace and bookcases in Plate XXIX. The raked out joints of the face brick of the breast of the fireplace gives that touch of ruggedness so essential to architecture of this character.

BRICK EXTERIOR DETAILS—PLATE XXX.

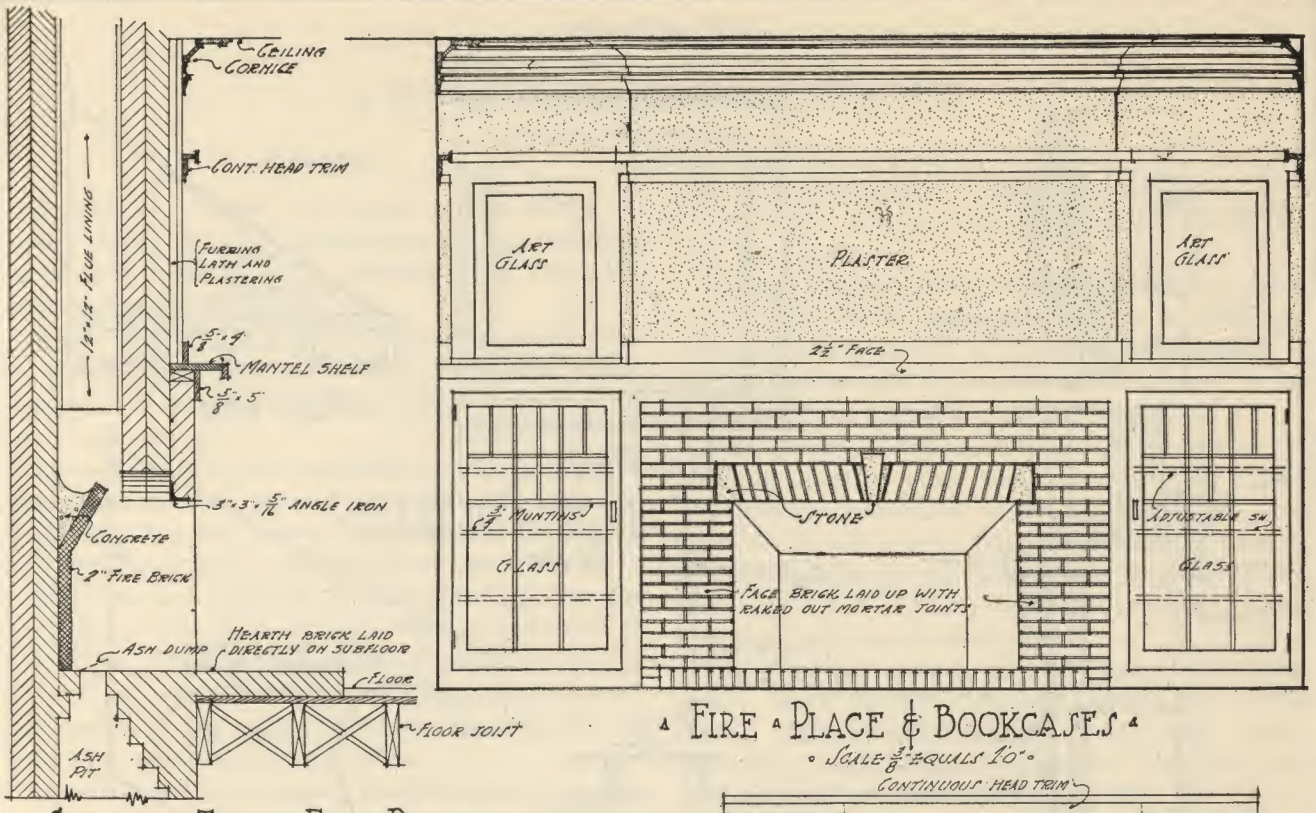
Plate XXX gives certain information on methods of construction of a brick veneered residence that should prove of value to all builders and material men, and of interest to prospective home owners.

The air spaces between brick and sheathing and sheathing and plastering (the latter formed by the studding) insure a wall that will ward off the cold in winter and the heat in summer.

The explicit instructions, shown in diagram, for setting windows in walls made of combination materials, assures an opening that is wind and water proof.

Outside walls are made up of studding, sheathing, brick, lath and plaster, the several members being mentioned in the order in which they are built into the wall.

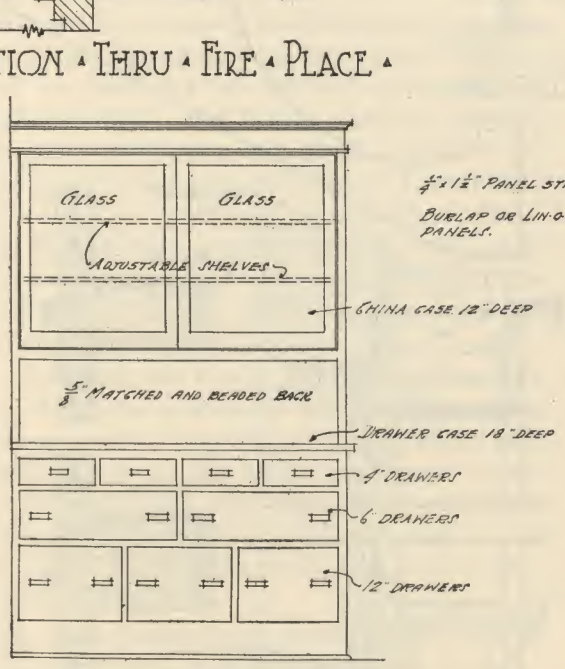
Other details given will be easily understood.



▲ SECTION ▲ THRU ▲ FIRE ▲ PLACE ▲

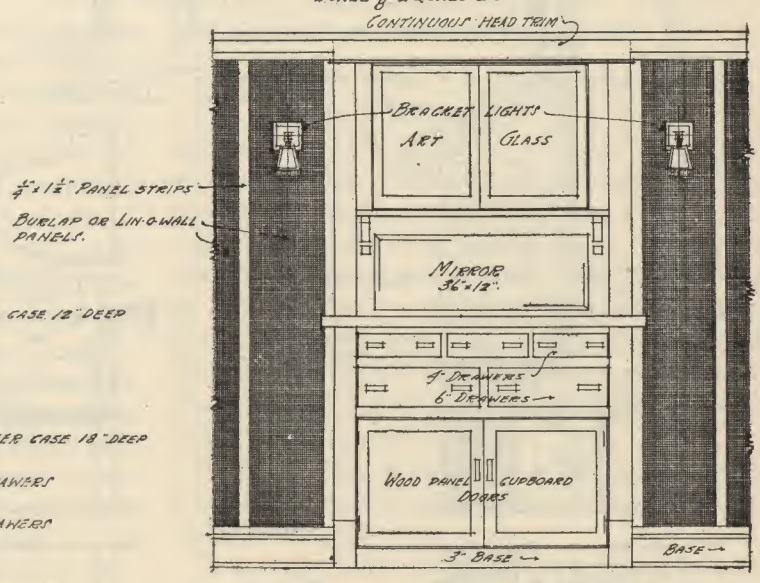
▲ FIRE ▲ PLACE & BOOKCASES ▲

• SCALE ⅜" EQUALS 1'0" •



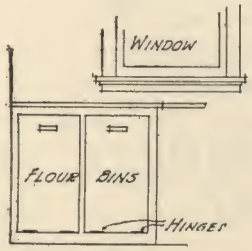
PANTRY CUPBOARD

• ⅜" EQUALS 1'0" •



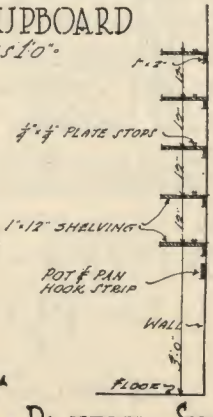
▲ DINING ▲ ROOM ▲ BUFFET ▲

• SCALE ⅜" = 1'0" •



▲ PANTRY ▲ WORKTABLE ▲

• ½" SCALE •



▲ PANTRY ▲ SHELVING ▲

▲ DOOR & WINDOW ▲ TRIM ▲

• THRUOUT SECOND FLOOR •

▲ DOOR TRIM ▲

• IN CLOTHES CLOS •

▲ SHEET ▲ NO ▲ 2 ▲

▲ OF ▲

▲ INTERIOR ▲

▲ DETAILS ▲

• SCALE ⅜" EQUALS 1', ½" & 1"F.S. •

Plate XXIX. Details of Interior Finish, to Scale, for Modern Residence, Design No. 6636, Shown on Page 116.

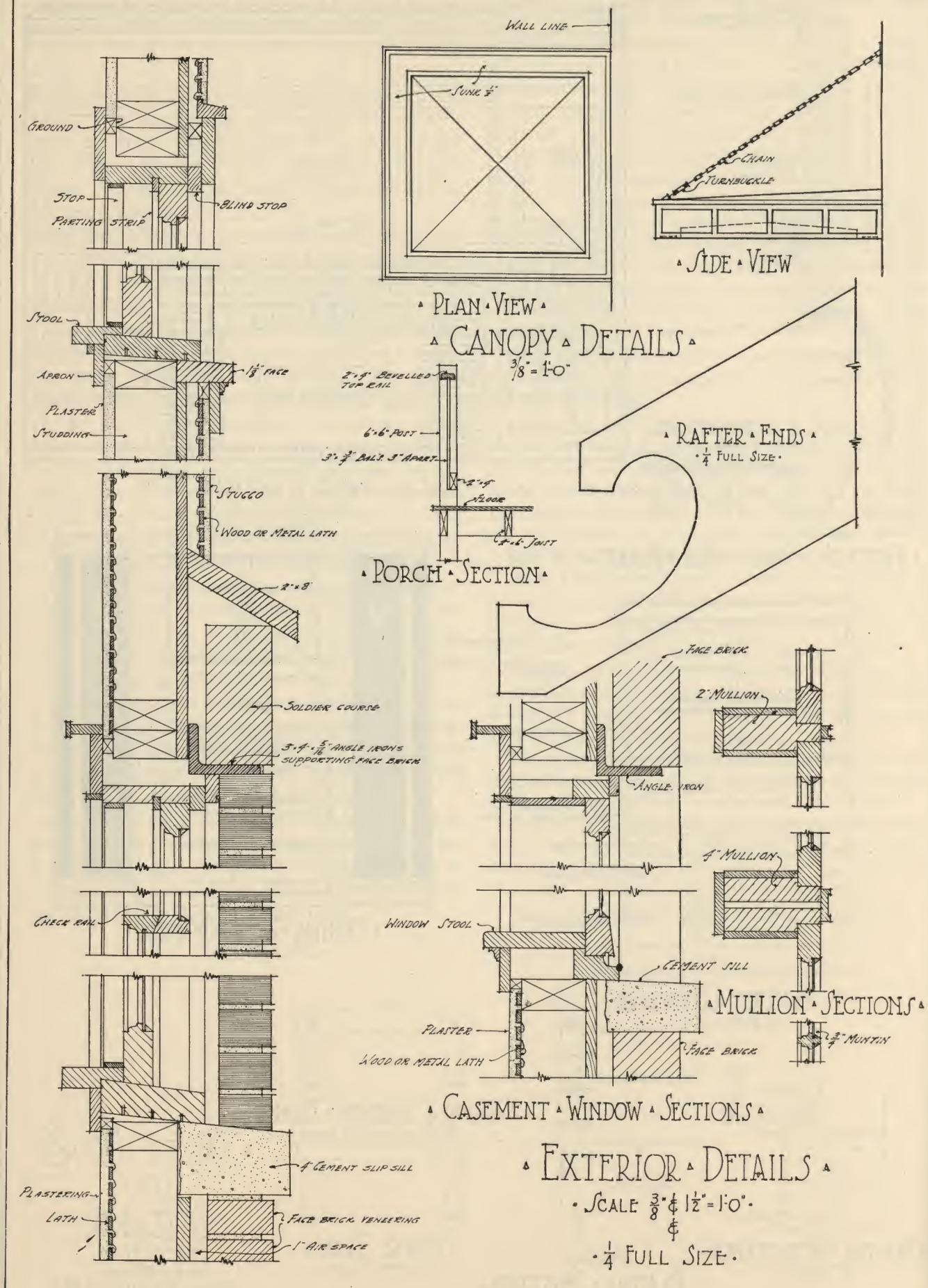


Plate XXX. Exterior Details of Construction, to Scale, of Modern Residence, Design No. 6636, Shown on Page 116.

CHAPTER XXI.

A HOME BUILDING PROJECT FROM A TO Z

Foreword.

A man who builds for himself or for others assumes moral and civic obligations to those residing or owning property in the community in which the structure is to be erected.

A new building should be an asset to the locality in which it is put up and then, and in that event only, will it prove the greatest possible asset to all concerned therein.

These facts now are recognized by the public and based thereon is a demand for better buildings, for buildings that will serve their purpose acceptably and constitute, also, a definite local improvement.

Man does not build for himself alone and has not the right to put up a structure that is unworthy of himself or ill-suited to the neighborhood in which it is built, or one whose utter lack of style will tend to depreciate the value of adjoining property, as well as to restrict its own values.

It should not be necessary at this time to urge the wisdom of securing complete plans before work is started or to point out the folly of attempting to build without plans. But before a set of plans is accepted their utilitarian and their architectural value should be examined with care. A beautiful structure that is not practical, or a practical structure that is a shining example of bad taste, lack those necessary elements of value which, with a little care and attention at the outset, may be imparted without increasing the cost.

There is another and a very practical side to this question. Where an attempt is made to build without plans, materials, the time of the workmen and the nervous energy of the owner are wasted to no purpose. In such cases, also, the finished structure is a source of discontent and dissatisfaction to all and a monument to the folly of the man or men who are responsible for it.

The day when houses were planned from day to day as the work proceeded has passed.

Today the call is for structures that are architecturally and artistically right and whose arrangements and appointments assure the occupants greater comforts and conveniences.

Properly designed, any building—a business structure, a house, a barn, a shed—may be made beautiful as well as useful, and buildings of an attractive appearance have an added commercial value that certainly is worth taking into account.

NOTE.—Too much information, in detail, cannot be acquired by the successful dealer in lumber and other building materials and the active builder. The information given in the twelve parts comprising this department of the book originally were written for the joint information of the contractor and the owner.

A third member has been admitted into the firm of "Building & Co.," and the information and suggestions which proved of great practical value to the contractor and the owner now is placed at the disposal of the building material merchant.

This feature of the book relates to phases of the building question other than those forming a part of building mechanics, altho the latter are considered. It will receive your close attention because of the scope of the many problems introduced and discussed, all of which are of direct interest to those identified with the building trade.

All of which leads up to and justifies this statement: THE MORE INFORMATION YOU CAN GIVE CUSTOMERS AND POSSIBLE CUSTOMERS, THE GREATER YOUR CLAIM FOR RECOGNITION AND PATRONAGE.

How to Purchase a Lot and Build a House.

The subject of this chapter is "A Purchasing and Building Operation" in its successive stages, viz., selecting a plot of ground, negotiating a purchase, procuring a mortgage, and building a house.

Let us suppose that an individual had the practical experience of a real estate broker, an attorney, an architect, and a builder. This would make an ideal combination, as the site would be selected at the right price; a satisfactory mortgage would be procured; the building would be suitable, and built at the lowest possible cost.

However, this is hardly possible, so this chapter is offered to explain and to illustrate in plain terms each transaction in its order.

It is remarkable how an owner will invest thousands of dollars in building, without first acquiring a general common-sense knowledge as a guide!

Time lost in preparing plans for buildings that are not erected is enormous, due to the estimates exceeding the appropriation.

Here is a suggestion to architects and builders: Why not work out your plans to standard timber sizes, and adopt other of the suggestions offered, which will save a large percentage of waste and reduce the cost?

It is not difficult to lay out a building after this method when the principle is understood. This is not a theory, as many buildings have been erected in this manner, and it seems logical that the length and quantity of material should be considered in working out a set of plans.

Selecting a Site for the Home.

(1) A suitable site may be selected in a section that has been gradually built up, or it may be in a new development. In either case, consideration should be given to the location with respect to the sun for cheerfulness and the prevailing breezes during the summer time.

(2) The surroundings should receive attention in case there are objectionable barns or business buildings in the vicinity which would affect the value of the property.

(3) It is not advisable to build a large house in a locality where there are smaller houses, and vice versa, nor is it advisable to build a high-priced house on low-priced property.

(4) A house built on a plot 40 feet front by 100 feet deep will have very little spare ground. The cash value of these lots should regulate the cost of the house, which should be about three times the amount paid for the lots.

(5) On the other hand, a plot 100 feet front by 150 feet deep, or more, is different, as the size of the plot is a consideration which to some extent would influence the amount that should be invested in a house.

A house built on a large lot has a better chance to increase in value than a small lot, as the increase in value will be obtained from the land, not from the building.

(6) It is prudent to build about the same class of house as the adjacent houses.

Some properties increase in value, and some decrease.

(7) For instance, if at some future time a car line was laid in front of the house, or objectionable business buildings were erected in the immediate vicinity, either of these would decrease the value of the property for residential purposes. The possibility of such a contingency should be determined by studying the probable trend of local development. If a purchase is made where the property is restricted to the erection of private dwellings, this menace is eliminated.

(8) In purchasing property, there are many points to consider, viz.:

Will the property increase or decrease in value?

Is the property restricted, and if so, what do these restrictions consist of?

Is the ground high or low?

Is water, gas, electricity and sewerage available?

(9) If the property is purchased from a "Land Improvement Company" and all improvements have not been installed, it is necessary to ascertain if the company is financially responsible, as they may fail to carry out their obligations, and the purchaser would be put to great expense and serious inconvenience.

(10) **The Level of the Ground.** It is desirable for the natural ground level to be above the sidewalk, as it eliminates the necessity of filling or raising the level of the ground and also takes care of the surface drainage. On the other hand, if the property has to be filled in, to bring the lawn level above the sidewalk, to shed the rain water towards the street, this filling should be estimated upon and added to the price asked for the plot; as the price may seem low, but after the cost of the filling is added it may be high as compared with other plots in the same locality.

(11) **Rock.** If rock has to be blasted out for the cellar, the cost should be estimated and added to the purchase price of the lot to determine what it will cost when ready to receive your house.

(12) **Water Line.** Under all property there is a water line, and it is well to ascertain how far it is below the surface. If the ground is low, or near marshes or other water, this water level might be so close to the surface that a special water-proofing treatment would be necessary to obtain a dry cellar.

Sewerage.

(13) **Establishing the Cellar Floor Level.** In case any plumbing fixtures, such as laundry trays, servants' water-closet, etc., are to be set in the cellar of the building, a fall from the cellar floor to the sewer is necessary for a flow. If the sewer in the street is not laid deep enough below the surface, the cellar floor line will have to be established high enough above the sewer to obtain a fall. This will raise the height of the exposed part of the building, and might destroy the symmetry of the house.

(14) To overcome this increase in height a terrace can be formed around the building or the ground can be filled, which is costly and should be estimated upon and added to the purchase price of the property.

(15) **Depth of Sewer.** A sewer laid 4½ feet down from the man-hole cover in the street will meet the average condition, except in cases where it is desired to have the piazza or porch floor only one, two or three steps above the grade; then the sewer would have to be deeper, or no plumbing fixtures placed in the cellar.

(16) **Cesspools.** If a cesspool is to be used, it is usually located 30 feet or more from the rear of the building. It is advisable to examine the sub-soil. The best is coarse gravel, as it allows free percolation. Inquiries should be made from the tenants in the neighboring houses (if there are any) as to their experience with their cesspools, as it might be necessary to have two of them.

Character of Building Site.

(17) **Top Soil.** The top soil on the site should be examined to ascertain its depth; at least six or eight inches of soil is necessary to get a first-class lawn; it should range in color from a rich brown to almost black. If the top soil is good it is value received in the purchase price; otherwise it must be supplied, which is an added expense.

(18) **Trees and Shrubs.** Trees, shrubs, etc., on a site are of value and should be uprooted and the roots covered with soil if they are in the way of the building, and then transplanted when the grading is completed.

(19) **Sand and Gravel.** Sand and gravel are used for making concrete, mortar, plaster, stucco, and all cement work. If this material can be obtained from the property it is a saving, as otherwise it must be purchased and hauled to the site.

Contract of Sale.

(20) We will assume that sufficient knowledge has been acquired to guide in selecting a plot. It would be unreasonable to expect to get all the best features in every plot; but after mature consideration the best selection should be made in the location desired.

(21) It is customary to sign a contract of sale, at which time the purchaser deposits with the seller 10 percent of the purchase price.

(22) A contract of sale is an instrument which covers the transaction so far as to show that the owner is willing to sell the property for a certain sum and the purchaser agrees to buy it.

(23) The 10 percent deposit of the purchase price is a guarantee to the seller of the purchaser's good faith and is necessary, as during the thirty days while the property is being searched it is out of the market and the seller might lose an opportunity of selling to another party.

(24) The contract should state that on a certain date, usually within thirty days, the transaction will be completed. There should be a description of the boundary lines of the property and figured diagram made from the survey. The distance from the nearest cross street to the nearest boundary of the property should be given.

(25) **Warranty Deed.** The seller should agree to give a "Warranty Deed," which guarantees the purchaser against any defect in the title or incumbrances.

(26) **Title Insurance Policy.** Before title to the property is taken by the purchaser, a search of the records is made by an attorney to ascertain if there are any flaws in the title, or claims against the property. If possible, the purchaser should obtain a "Guarantee Company's" title insurance policy, which is not expensive, and the fact of a sound company issuing a guaranteed policy is an assurance that the purchase is in perfect order.

Closing the Deal.

(27) In all agreements of sale a time is set for the closing; that is, when the purchaser takes title to the property. The word "closing" means that the selling transaction is to be completed.

(28) In some instances the seller has not been able to deliver the property with a clear title, as a flaw has been found in some previous conveyance. In such a case if the purchaser takes title he assumes all responsibility, which is not advisable, and the sale consequently falls thru. The seller has to return the 10 percent deposit.

(29) On the other hand, if the purchaser for any reason refuses to take title, he loses the deposit of 10 percent and runs the risk of an action at law for non-fulfillment of contract. Therefore, before signing "a contract of sale" all matters in connection with the property and the financing of the entire operation should be well considered.

Property is usually purchased:

(30) By paying the full amount of the purchase price in cash or certified check at the time of closing. Or by paying part cash and giving back a purchase money mortgage to the seller for the balance of the purchase price.

(31) **Providing for the Future.** A purchaser may desire to acquire a plot of ground before it rises in value, and may not have sufficient cash to pay the full amount, in which case part cash and a mortgage is given.

HOW TO FINANCE A HOME BUILDING PROJECT.

A Purchase Money Mortgage.

(32) When a purchase money mortgage is arranged for, the purchaser has to pay to the seller a further percentage of the purchase price in cash above the 10 percent deposit, which amount is agreed upon between the purchaser and seller (30 percent additional should be the minimum). The purchaser then gives back a mortgage on the property to the seller for the balance of the purchase price, upon which the purchaser pays an annual interest of from 5 to 6 percent, due and payable semi-annually. It should be stated in the mortgage that the mortgagee will accept payment at any time during the term of the mortgage. These mortgages are usually made for a period of three years.

To illustrate: A purchaser buys a piece of property for $2,500, paying to the seller in actual cash $1,000; he then owes a debt to the seller of $1,500, and he gives back to the seller a mortgage on the property for this amount which secures the debt. (40 percent cash—60 percent mortgage).

(33) **Building Loans.** When the property owner desires to build with the aid of a building loan, the purchase money mortgage must be paid off. Building loans are procured from companies or individuals who make a specialty of this form of loan. The money is advanced to the borrower from time to time as the building is being constructed, and the interest commences from the date of each payment.

(34) Building loans are not attractive to the average investor in mortgages, owing to the investment being made in installments, the sliding scale of interest and the time necessary for the transaction. Loaning companies are organized for this purpose. They make building loans and on completion of the

building they merge them into first mortgages, which they sell to private investors, as guaranteed mortgages, at a lower rate of interest, the excess interest compensating the loan company for the guarantee and collection of interest and taxes.

The building loan should merge into a permanent mortgage without additional expense.

(35) **Commencing Work Without a Loan.** In case an owner has a certain amount of cash and desires to build, he can pay off the purchase money mortgage if there is one and commence the work. Payments can be made to the contractor up to the amount in hand; then a building loan can be procured to pay the balance due on the contracts. When possible this is the better way, as the mortgagee has an opportunity to see the character of the work.

Mortgages.

(36) A mortgage is an instrument which secures a debt.

The giving of a mortgage works no change in the ownership of the property. The giver of the mortgage is still the owner.

Mortgages are usually made for a term of one to five years.

(37) The mortgagor should pay the interest, taxes and fire insurance promptly. Each installment should be paid on the day it becomes due, but in most mortgages twenty to thirty days grace are allowed for payment of interest.

(38) When the interest and taxes are not paid it practically increases the mortgage, which reduces the security, and it becomes necessary for the mortgagee to "foreclose."

(39) Foreclosure means that the mortgagee brings an action at law to compel the mortgagor to pay the principal and interest, or the property is sold at public auction.

(40) If the mortgage is a safe one and the interest and taxes are promptly paid, the mortgagee may extend it for another term at maturity, or another mortgage can be procured by which this mortgage can be paid off.

(41) If the mortgage is extended, the cost of extension is slight, but if a new mortgage has to be procured, the expense will be about 3½ percent on the amount of the mortgage.

(42) A safe mortgage means that it is not more than 60 percent of the value of the house and grounds.

(43)

Purchase price for the plot of ground	$2,450.00	
Expense: Tax, search, and recording fee	50.00	
	$2,500.00	
Cost of building complete, with all expenses (see itemized list)	7,500.00	
		$10,000.00
60% of $10,000.00	$6,000.00	
		6,000.00
Cash required		$ 4,000.00

Expenses in Connection with the Building Loan of $6,000.

Brokerage and legal fees, approximately 3½% on amount of loan, $6,000.00		$210.00
Interest on each advance of the loan:		
6% for 6 months on $2,000.00	$60.00	
6% for 3 months on 1,300.00	19.50	
6% for 3 months on 1,300.00	13.00	
		92.50
		$302.50

The final advance is made when the building loan is merged into a first mortgage, and the interest from that date is not part of the cost of the building.

Itemized List Showing Cost of Building.

Carpenter and Mason work	$4,849.00	
Plumbing and Gasfitting	700.00	
Steamfitting	450.00	
Painting and Finishing work	300.00	
Electric wiring and bell work	130.00	
Gas and Electric fixtures	125.00	
Full length fly screens	100.00	
Grading and Paths	150.00	
		$6,804.00
Architect's fees, 5% on $6,804	340.20	
Expense of Building Loan	302.50	
Insurance	19.28	
Contractor's bond, ½ of 1% on $6,804.00	34.02	
	$7,500.00	

If the plot of ground has increased in value since the purchase, it will reduce the amount of cash the owner has to supply at the rate of 60 percent for every dollar the value has increased above the $2,500 purchase price.

The Annual Carrying Charges.

5½% on $6,000	$330.00
Taxes, approximate	100.00
Fire insurance	19.28
Water Tax	30.00
	$479.28
Rent	$900.00
Carrying Charges	479.28
Balance	$420.72

Less Repairs and Painting.

(44) A house and ground costing $10,000 should bring in an annual rental of at least $900. Thus it will be seen that there is $420.72 return on a total outlay of $4,000 (over 10 per cent). The owner therefore could live in a house for $479 per year—that would cost him $900 to rent—by investing $4,000 in cash.

If the right site has been selected and the building built economically, there is always the possibility of the property increasing in value.

Problem:

If the cost of a house and plot of ground is $8,000
What should the ground cost?
What should the building cost?
Figure out the expenses.
Figure out the amount of mortgage.
Figure out the carrying charges.

Subordination of a Purchase Money Mortgage.

(45) In some cases those who make a business of building have two mortgages on their property. This is done to reduce the amount of cash necessary for the operation. For instance, some development companies who desire builders to erect buildings on their property to create activity and induce the public to buy land, are willing to accept a percentage of the purchase price in cash, and subordinate the balance to a building loan and permanent mortgage.

(46) To illustrate: A purchaser buys a piece of property for $2,500 and pays in cash 40 percent of this amount, which is $1,000, the seller accepts a second mortgage for $1,500, which is subordinated to a first mortgage up to a specified amount. The object of specifying the amount is to prevent the first mortgage being made so large that the second mortgage would be without sufficient security.

(47) For instance: Suppose a house and plot is valued at $10,000; and an exceptionally large first mortgage was given for $7,500 and the seller subordinated to the $7,500 first mortgage a second mortgage of $1,500 for part of the purchase price; the second mortgage would be without sufficient security.

How to Apply for a Building and Permanent Loan.

(48)

Application for Loan on Bond and Mortgage to the ..... Company

Application is hereby made for a Building and Permanent Loan of $6,000 for Three Years on First Mortgage.

If the cost of a house and plot of ground is $8,000.

Owner: John Smith, Broadway, New York.
Bond of: Mary Smith, Broadway, New York.
Location of Property: West side of Linden Avenue.
Distance from Nearest Cross Street: 100 feet N. from N. W. corner of Elm Street.
Size of Ground: 50x100.
No. of Stories: Two and Basement.
Building Material: Concrete Foundation, Frame and Stucco.
To be Used: For a Dwelling.

Cost of Building	$ 7,500.00
Value of Grounds	2,500.00
Total	$10,000.00

Signature of Applicant: John Smith.

A set of plans and specifications must be submitted with the application.

A three or five-year mortgage is called a permanent loan to distinguish it from a building loan which terminates at the completion of the building.

The company to whom the application is made employs experts who place a value on the proposed building from the plans submitted, visit the site to ascertain its value and usually offer a 60 percent mortgage on the house and ground.

Advances by the Loaning Company to the Owner.

The first advance by the loaning company to the owner is made on the rough enclosure; second, on the brown mortar; third, on the standing trim and the balance upon completion. Before making the first payment the loaning companies require a survey of the plot showing the actual location of the building. This is to show that the building does not encroach beyond the restricted lines or on the adjoining property. When the brown mortar is on, about 50 percent of the loan is advanced. The company is safe in advancing this amount, as they have the building and the ground as security.

HOW TO UNDERSTAND A BUILDING PLAN.

To find the area of a building, multiply the width of the first floor by the depth.

(50) It is necessary to understand a plan and become familiar with the sizes of rooms, as the cost of a building is regulated to a considerable extent by the area which it covers. If the rooms are made larger than required, the cost of the building will be increased without any material benefit being received.

(51) Measuring the rooms of any house is a good method to get the sizes in mind.

(52) An ordinary builder's 2-foot rule is required. Every inch upon which, for the purpose, will indicate 4 feet.

¼ inch will equal 1 foot.
½ inch will equal 2 feet.
¾ inch will equal 3 feet.
1 inch will equal 4 feet, and so on.

This means that ¼ of one inch on the rule, or scale, as it is called, represents 1 foot. With this scale a diagram of a room can be made on paper. Let us take, for example, a room 15 feet wide by 16 feet deep. On an ordinary piece of paper draw a horizontal line 3¾ inches long; this will represent the width of the room (15 feet). At each end of this line draw a line at right angles, 4 inches long; this will represent the depth of the room (16 feet). Connect the two ends of the lines drawn at right angles to the horizontal line. The resultant figure will represent the size of the room proportionately reduced to scale, ¼ of an inch on the drawing equalling 1 foot in the room. If the walls are 6 inches thick draw parallel lines around the diagram 6 inches by the scale (⅛ of an inch) outside the first lines. The space within the two lines will represent the thickness of the walls.

(53) Look at the room and imagine it cut horizontally in two at a point half way between the floor and ceiling, and the upper portion removed (if this were possible). A drawing made of what

remained would be a plan. On a plan the openings in the walls, partitions, etc., are indicated by lines drawn at right angles across the lines indicating the partitions or walls.

Next mark on the diagram the correct position of the doors, windows and fireplace in the room. Starting in one corner of the outside wall, measure with the 2-foot rule the distance to the nearest window, measure to the line of the movable sash. Suppose it is 3′ 6″ (three feet six inches—feet are indicated by ′ and inches by ″). Mark this on the diagram by a line drawn across the two lines indicating the outside walls ⅞ of an inch from the corner (⅞ of an inch will be 3 feet 6 inches by the scale). Then measure the width of the window sash that moves up and down, say it is 3′ 0″; mark a cross line 3′ 0″ by the scale from the first cross line; this will indicate the window. Continue in the same way around all four walls, marking on the diagram any breaks, all doors, windows and fireplace.

Measure a room and bathroom on the second floor and make a diagram in the same way. This simple practice should enable anyone to understand a plan, as each line marked on the diagram will represent what has actually been visible, whereas a new plan has to be visualized.

(54) It is good practice in studying over a set of plans to imagine you are in the building and let the lines indicate the walls, partitions, doors, windows, etc., as tho you were really looking at them. This takes very little effort to acquire and is eminently practical.

Problem:

Make a measured plan of:
A first story room.
A second story room.
A bathroom.

(55) The practice of measuring rooms is a preparation for the study of an architect's plan.

Description of Plan Shown on Diagram.

The plans, page 165, are drawn for a plot of ground 50 feet by 100 feet. It is more difficult to prepare plans for a small plot than for a large plot, as the requirements have to be worked out in a restricted area.

The double lines indicate the outside walls and partitions. The cross lines on the outside walls indicate windows, and are marked with the figure 1 The sizes marked by the windows, for instance 2 ft. 7 in. by 5 ft. 2 in., indicate the size of the window sash. The first dimension is the width and the second the height.

Doors are shown on the inside partitions by spaces and are numbered with the figure 2. The line drawn at an angle at one side of each door space indicates the door, and the curve shows the swing of the door. Door should be hung on the correct jamb in order to get the best access to the room and should be clear of any other door. Closet doors should swing to admit the window light. (Jamb means the wood casing on which the door is hung and is set at right angles to the wall from plaster face to plaster face.)

The doors shown on the plans and marked with the figure 3 indicate French casement doors. This type of door has panes of clear or leaded glass within 12 inches of the floor and 4 inches of the top of the door, set in wooden bars, each door having 12 to 15 small lights. These doors are attractive and usually hinged, but if desired they can be made to slide.

A fireplace is indicated by the figure 4. A special design is usually made for the mantel, or a mantel can be selected from stock.

The dotted lines in the living room and dining room indicate false ceiling beams, marked with the figure 5. The sizes of the ceiling beams should be called for in the specifications; the dotted lines indicate how they are to be laid off or spaced on the ceiling.

Doors and windows if correctly located in a room will provide proper space for the furniture.

The dining room is planned as follows: The ceiling light is located directly over the center of the dining table; space is arranged for a buffet near the butler's pantry door; easy passage is provided around the table for serving; the window light is ample and arranged for good ventilation. The approach to the dining room from the kitchen is thru the butler's pantry. This is for convenience of serving, and the pantry acts as a trap for the smell of cooking.

The dining and living rooms are connected by means of French casement doors which will give good ventilation from the front to the rear of the house.

The hall and living room are divided by columns with leaded glass lights between the columns; the division is sufficient to accentuate the living room from the hall, yet the hall and living room can be treated as a "living room hall" if so desired.

The average living room furniture consists of a piano, table, writing desk, several odd chairs and a small table for a lamp.

There is a coat closet in the hall on the first stair landing, three steps up and convenient to the front door.

The staircase is shown by a succession of lines close together, marked with the figure 6. This should have a window for light and at least one landing, as a straight staircase is commonplace and a landing relieves it and reduces the danger of accident.

In all modern houses two bathrooms are desirable, one for the family and one for the servants. The main bathroom should be fitted with a towel rack, a medicine closet, a roll rim bathtub, pedestal lava-

tory, and syphon acting water closet with lowdown porcelain tank. White tile set on the floor and side walls is sanitary and produces a handsome finish.

The bedrooms are arranged with reference to the location of the furniture. In the main bedroom a space is provided on an inside partition for twin beds. There are spaces near the windows for the bureau and chiffonier, with pendant electric fixtures placed over them. A small table is usually placed between the beds. Two chairs and a rocker will complete the furniture for the average room. This bedroom has a connecting door to one of the other bedrooms in case there are children.

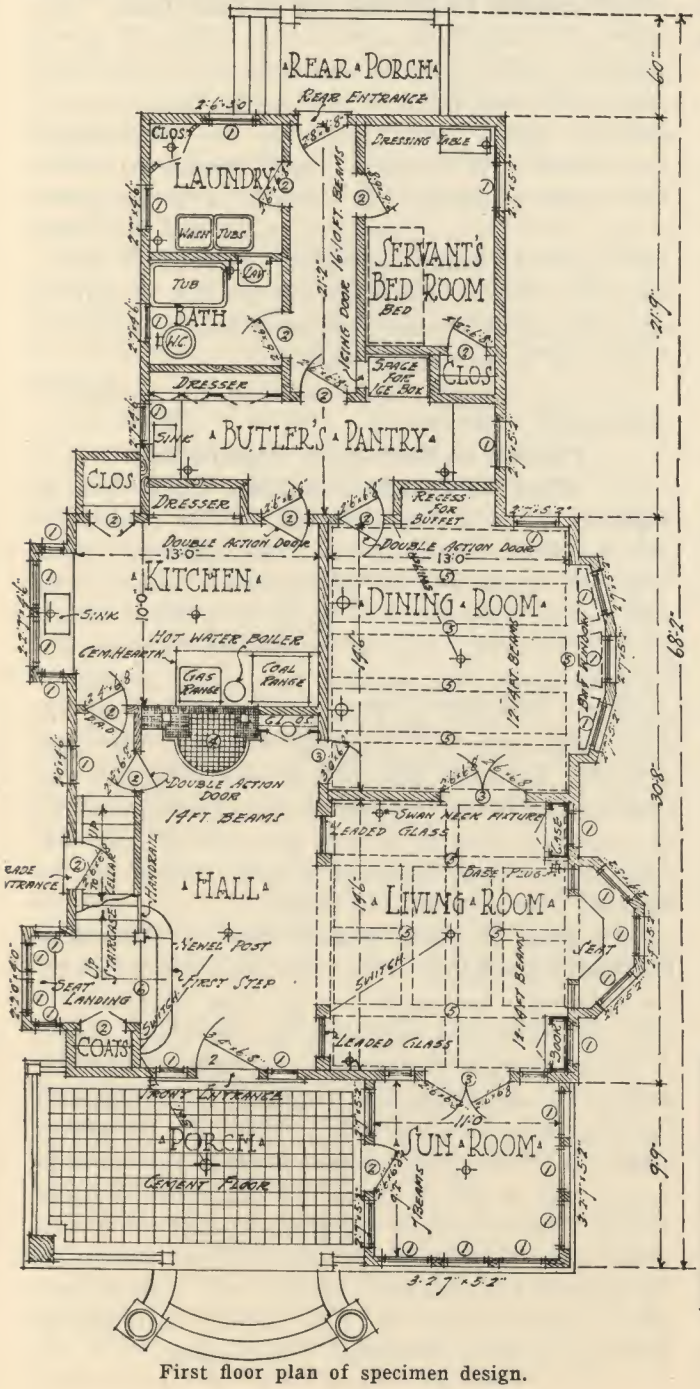
The other bedrooms are laid out for three-quarter beds requiring an interior wall space of 4 feet; and the spaces necessary for the furniture are similar to the main bedroom.

A good closet is provided for each bedroom and two closets for the main bedroom. The linen closet is in the second story hall.

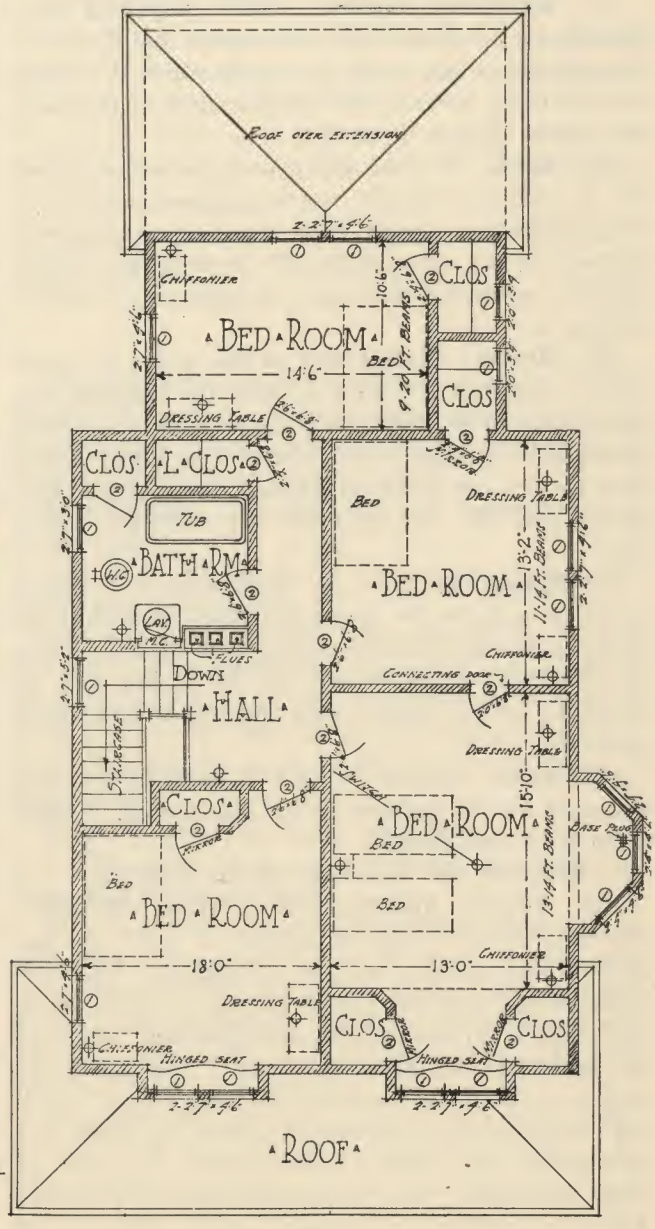
Windows in all rooms are arranged to give good light and ventilation.

Working Department.

It will be noticed on the plan that the kitchen is placed centrally, adjoining the dining room. This is a good arrangement in a small house. A room and bathroom for the servant is located on the first floor. This does away with the necessity of a back stairway and has proved a good arrangement. The upper part of the house is then for family use exclusively.



First floor plan of specimen design.



Second floor plan of specimen design.

The kitchen is provided with a closet, sink, dresser, coal and gas ranges, boiler, water heater, etc. In the butler's pantry there is a space for the ice-box convenient to the kitchen which has the benefit of thoro ventilation. There is a pantry sink and dresser for china and glasses.

The laundry is also located on this floor.

HOUSE PLANNING TO SAVE WASTE.

The most practical method of building, substantially, with as little waste as possible, forms the "Economics of House Building." To accomplish this result it is necessary to proceed as follows:

Plan the building to timber sizes.

Select the most serviceable material available in the locality.

Create keen competition between contractors, mills and supply houses, for the various labor and material required in the construction of the building.

(57) **Excavated Material.** Before preparing specifications, a pit about three feet square and four feet deep should be dug in the area upon which the house is to be built, and an examination made of the various strata (layers of earth).

(58) **Sand.** If good sharp sand is found which can be used for concrete, mortar, plaster and stucco, the specifications should state that this material can be used in the construction of the building; otherwise the estimators will make an allowance for purchasing it.

(59) **Gravel.** Should part of the strata be good gravel, it will be a saving to build the footings and cellar walls of concrete. A waterproofing compound mixed in or applied to the concrete is highly desirable to protect a cellar against dampness. The gravel can also be used for the concrete cellar floor.

(60) **Loam.** If the soil composing the upper strata is suitable for making a lawn, it should be trenched out and piled in a heap at a distance from the building, where it will not be in the way of workmen or get mixed with any other excavated material.

(61) **Rock.** If rock is found it can be blasted out and used for the building of the cellar walls, setting it up in cement mortar.

Selecting the Materials for the Building.

(62) **Typical Specifications — Pricing Material.** The material for framing should be good bearing timber, such as pine, spruce or hemlock. For convenience and economy choose the timber available in the locality. When "typical specifications" are used the building invariably costs more. Too much emphasis cannot be laid against this loose way of building. Specifications should be drawn up after full particulars have been obtained as to the price of local materials. This information can be procured from the lumber and general supply dealers, for lumber, plaster, cement, lime, brick, shingles, roof tile, etc. By this means serviceable material can be selected at reasonable cost.

(63) **Classification of Lumber.** The carpenter's material is divided into two classes—the lumber and the millwork.

(64) All floor beams, studs, girders, roof rafters, sheathing, rough flooring, etc., comprise rough timber.

(65) **Estimates from Lumber Dealers.** Lumber dealers as a rule make estimates on the rough timber, on printed forms of their own, from lists sent to them by builders. They figure according to the listed sizes and deliver the material at the building, for which they take a receipt from the superintendent in charge of the work.

(66) **Builder Makes Out His Lumber Lists.** This practice of estimating is due to the difference in the methods employed by various builders or their foremen in the construction of the work. Some are economical, others thru ignorance or carelessness are wasteful. If a lumber dealer contracted to deliver sufficient material to complete a building and it was wastefully constructed, more material than was figured on would be needed. The builder therefor takes off the quantities and the list should be accurate and according to his own or his foreman's method of laying out the work.

The kind of timber being selected, the method of construction follows:

Pointers on Economical Construction.

(67) **Work to Standard Lumber Sizes—Not to Figures.** It is the general custom for owners to give an architect the sizes of rooms desired, from which he works out his general floor plans, or as near to the sizes given as the plot or other conditions will allow. This often runs the cost of the building above the amount the owner desires to spend. "Working to Figures" this is called. A much better way is "Working to Sizes." By sizes is meant the sizes into which lumber is cut for building purposes; lumber is usually supplied to the market in lengths of even dimensions—four, six, eight, ten, twelve, fourteen, sixteen, and so on up to thirty feet in length, or larger.

(68) **Span of Floor Beams—How to Determine the Width of a Room.** Floor beams are supported by the side walls and girder on the first floor and by the side walls and partitions on the upper floors. A 6-inch bearing is required for each end of the beam. In calculating the length of the beams this bearing has to be allowed for. Therefore the rooms should be of odd dimensions. A room 13 feet wide would take a 14-foot beam. If the room is made 13 feet 6 inches wide it requires a 16-foot beam, and would cause a waste of 18 inches on each beam and the labor of the mechanic sawing it off. This 18-inch piece is of no use and is a dead loss—it costs just as much per foot as the timber that is used.

(69) **Spacing of Floor Beams—How to Determine the Length of a Room.** The length of a room should be determined with regard to the spacing of the floor beams. It is customary for floor nailing, to set a beam against the studs at each end wall and the spacing starts from the center of these beams. Floor beams are usually set 16 inches from center to center. Therefore, if the length of a room is 13 feet 4 inches from plaster face to plaster face, it would make ten 16 inch centers, and eleven beams would be required. For every 16 inches additional in the length of the room one beam must be added. Plasterer's lath is cut in lengths of four feet to work to this centering and each lath has four nailings.

(70) **Length of Room Figured by Beam Centers.** If a room about 15 feet long is desired, the room should be figured 14 feet 8 inches, or 14 feet 6 inches if at one end there is a cross partition with double beams under it. This will work to eleven 16 inch centers requiring twelve floor beams. The 4 or 6 inches difference will not be noticed in the actual size of the room.

(71) **Spacing of the Studs.** Upright studs, either 2 inches by 4 inches or 3 inches by 4 inches, are used for the outside walls and inside partitions, and are set 16 inches from center to center to work to the lathing.

(72) **Height of Rooms.** The height of rooms from finished floor to plaster of ceiling is usually figured to the half foot. There seems no logical reason why the height of rooms should be 8 feet 6 inches, 9 feet, 9 feet 6 inches, 10 feet and so on. If a room about 9 feet 6 inches high is required a stud 10 feet long should be used, which will give a height of 9 feet 3⅛ inches and the difference in height will not be noticed.

(73) To illustrate: Let us assume that the floor beams are 2 by 10 inches and are notched out on the under side 1 inch. This notching gives sufficient play to bring all the beams level at the top ready for the flooring.

(74) Beams vary a trifle in depth from ⅛ to ¼ of an inch. This is adjusted in the 1 inch or less cut, so that when the beams are set on the sill or plates, the upper edges are on a level or "top flush" as it is called.

(75) Therefore, allowing for the notch, the distance from the top of the sill to the top of a 10-inch floor beam is 9 inches. In figuring the height of a room from the length of a stud this 9 inches has to be deducted from the height of the stud, as the studs and floor beams always sit on the sill.

(76) Further, a rough floor is ⅞ inches thick, felt paper ⅛ inches and the finished floor ⅞ inches, making in all 1⅞ inches. This added to the 9 inches makes 10⅞ inches, which has to be deducted from the height of the stud, leaving 9 feet 1⅛ inches from the finished floor to the top of the stud.

(77) On top of the 10-foot studs a 4-inch by 4-inch horizontal plate is set; this is an added height of 4 inches. The floor beams of the room above rest on the plate and are notched down 1 inch or thereabouts in the same manner as the beams below, by which 1 inch is lost—allowing a loss of 1 inch more for the lath and plaster of the ceiling, the actual height gained from the plate is 2 inches, which added to the 9 feet 1⅛ inches makes the actual height of the room 9 feet 3⅛ inches.

Length of stud	10′ 0″	
From top of sill to top of floor beam	0′ 9″	
Rough floor	0′ ⅞″	
Felt paper and finished floor	0′ 1″	0′ 10⅞″
		9′ 1⅛″
Gained by the plate	0′ 3⅛″	
Actual height of room		9′ 3⅛″

(78) It can be seen that if the rooms were figured 9 feet 6 inches high in the clear, the next length of stud being 12 feet long, there would be a loss of 21⅛ inches from each stud in all outside walls and inside partitions on each floor in addition to the time lost by the mechanic.

Additional length of stud	24″
Utilized to get room 9′ 6″ high	2⅞″
Waste	21⅛″
	24″

If a stud 22 feet long is used and cut in two—there would be a loss—material 9⅛ inches—the mechanic's time in cutting—and the additional cost of long length studs over short lengths.

Roof Rafters. The type of roof should be determined first.

(79) Roof rafters, like studs and floor beams, are cut to even dimensions.

(80) Sometimes material can be saved by lowering the pitch of a roof a few inches to use a certain length of rafter, which may not affect the roof shedding water or the general appearance of the building. The length of the rafter should be an even dimension.

Diagonal and Horizontal Sheathing. There are two methods in common use of sheathing a building: Diagonal and Horizontal.

(81) When the sheathing boards are laid diagonally they are nailed to the sill and to each stud, which forms a diagonal brace; and it is not necessary to brace the studding. When the sheathing boards are laid horizontally, it is necessary to set diagonal braces between the studding.

(82) Diagonal sheathing takes more time, makes considerable waste and frequently the boards are not fitted tightly together. It is very difficult to trace a rain water leak with diagonal sheathing, as the water follows the diagonal joints. Horizontal sheathing can be tightly fitted, is more economical

and gives better results, as in drying out it does not split the shingles or crack the stucco.

HANDLING CONSTRUCTION CONTRACTS TO ADVANTAGE.

Without question one of the most important questions to contractors and home owners alike is that of cutting down waste in lumber. Almost as important is the problem of buying millwork economically.

Millwork.

(83) Window frames, sash, cornices, balustrades, gable boards, piazza columns and the general outside exposed woodwork, together with the interior woodwork, comprise the millwork.

(84) **Outside Woodwork.** The outside woodwork should be made of one of the soft woods which will not split or check from the action of the weather.

(85) **Interior Woodwork.** The interior woodwork can be made from various woods, according to the rooms and the finish desired.

(86) **Wood for Kitchen, Etc.** For the kitchen, butler's pantry, laundry, etc., cypress, birch or Southern pine is used, as the cost is reasonable. These woods may be painted or stained.

(87) **Wood for Hall, Living Room, Etc.** For the entrance hall, living and dining rooms, staircases, etc., straight oak, birch or chestnut is much used—they cost about the same. These woods can be stained and finished in various shades. Samples of these shades can be obtained from the manufacturers of stains. Architects usually submit samples for the inspection of their clients, and from these samples selections are made.

(88) **Wood for Bedrooms.** For bedrooms, white wood or white pine casings around doors and windows finished in white or cream enamel, with the doors of birch veneer and stained dark mahogany, make a rich effect. Stained or tinted woods are now much in vogue. The finish largely is a matter of individual taste. The enamel on the casings can readily be done over after a few years' wear; varnished or waxed work is not so easily restored. With the cream and mahogany finish, brass hardware should be used with glass door knobs.

(89) **Other Woods for Bedrooms.** There are many other woods used for casings in bedrooms, viz.: maple, bass, white mahogany, oak, ash, pine, birch, etc., and the doors are usually made of the same kind of wood.

(90) **Wood for Staircase.** The main staircase should be built of the same kind of wood that is used for the hall, or if the staircase starts from the living room it should match the wood of that room.

Planning the Staircase.

(91) **Treads and Risers.** A staircase has various parts. The tread is where the foot is set. The "risers" are the vertical pieces between each tread.

The correct proportion of a tread to a riser is 7½ inches rise by 10½ inches tread, and the higher the riser is made the narrower the tread.

Proportionate Dimension of Treads and Risers.

To illustrate: 7½ inches by 10½ inches is the standard, and the following are the ratios most commonly used:

7½	inches	by	10½	inches
8	inches	by	10	inches
8½	inches	by	9½	inches
9	inches	by	9	inches

The 9 inch by 9 inch is the highest ratio allowable and should only be used for back staircases, as it makes a very steep and difficult stairs.

Usual Staircase. A 7½-inch rise by a 10½-inch tread is a good, easy stairway.

These figures do not include the nosing of the tread, which is the projection of the tread from the face of the riser under which a small moulding is set.

(92) **Newel Posts.** The newel posts on a staircase should not have any mouldings projecting beyond the main shaft of the newel, as it cuts down the width of the "stairway" and is dangerous.

(93) It is better, at a point on the newel above the handrail to make a setback of ¾ of an inch on each side of the newel, thus—if the newel is 6 inches by 6 inches, the part above the handrail would be 4½ inches by 4½ inches. A mould with curved top, having a ¾-inch projection can be worked on as a cap and will be on the same line as the main shaft. This is a very practical and good newel, as it can be paneled, fluted or carved.

Note: Mouldings on newels should not project over the stairway.

(94) **Handrail.** The handrail, balusters, strings, etc., are made of various design to suit the character of the building.

Stock Doors, Sash and Trim.

(95) **Material From Specializing Mills.** There are certain mills who make special kinds of doors of various woods; they are made in such quantities that they can be purchased, including the freight, at less cost than they can be produced by the average woodworking mill. They are good substantial doors of various thicknesses and design. A catalog of these doors should be in every architect's and dealer's office.

(96) Window sash is made to stock sizes, and if stock doors and sash are desired, to save cost, the plans should call for the actual sizes these specializing mills make.

(97) Stick trim and base can also be procured in the same way, but care must be taken to select a good design of moulded trim, otherwise it will mar the general effect of the interior.

Sub-Contractors.

A contract for a complete building is sometimes made with one contractor, who sublets part of the

work to other contractors who are called sub-contractors. In most instances he is a carpenter, or a mason contractor. He may sublet the mason work if he is a carpenter; or if a mason, he may sublet the carpenter work.

Carpenter or Mason the General Contractor.

(99) Usually a carpenter contractor makes the contract with the owner. He may buy his own mason materials and have a mason foreman carry out this part of the work, or as above stated, he may sublet this part of the work to a mason contractor.

(100) **One Contractor for All Trades.** When the contract is made with one contractor, he adds to his estimate a percentage of profit for his executive work in connection with the sub-contractors. This is over and above the profit he has included in his estimate upon his own part of the work. This additional profit, created by giving all the work to one contractor, is sometimes saved by:

(101) **Dividing up the Contracts—Separating the Contractors for the Various Trades.** An architect can divide up the work and make contracts with the various sub-contractors direct, which eliminates the additional profit of the "General Contractor."

(102) Wherever practicable, the work should be divided up as follows:

Carpenter and Mason work.
Plumbing and Gasfitting.
Heating Plant.
Electric Wiring and Bell work.
Painting.
Gas and Electric Fixtures.
Fly Screens.

(103) The carpenter and mason work includes excavating, footings, walls, piers, plastering, stucco, tile work, framing, exterior and interior wood finish, mantels, glass, hardware, flashings, gutters and leaders.

(104) It has been proved more satisfactory to divide up the contracts, as the various contractors are then responsible for the quality and promptness of their work to the architect and owner. If any difficulties arise, instructions can be given to them direct, and not thru the medium of a second person.

(105) Further, it is often possible by dealing direct with the sub-contractors to make selections of fixtures and materials that will reduce the cost of the work, by which the owner benefits; and the contractors receive their money direct from the owner, which is preferable.

(106) **Estimates.** Discrimination is necessary in selecting the builders, plumbers, steamfitters, etc., who are invited to figure upon the work; this should be done before the estimates are taken and not afterwards, as contractors lose much time each year by taking off quantities in making estimates. The lowest estimator should be awarded the work—**Provided**—the owner, the architect and the material men are satisfied respecting his ability and honesty.

Mill and Supply House Competition Through the Medium of Contractors.

(107) There is more in selecting the contractors than appears on the surface.

Let us assume that four contractors for the carpenter and mason work are invited to figure. The mill work and rough timber usually amounts to one-third of the carpenter and mason contract. Thus, if all four contractors relied upon one or two mill estimates, it would materially reduce the competition.

(108) Therefore, it is necessary to select contractors who will get estimates from various mills. There should be at least four mills represented.

This method should be applied to the other trades, plumbing, steamfitting, etc. In this way keen competition will be assured.

(109) For the finished hardware, gas and electric fixtures, mantels and fly screens, a stipulated amount should be set. For a house to cost approximately $7,500 the following amounts should be ample:

Finished Hardware	$130.00
Gas and Electric Fixtures	150.00
Mantels (each)	75.00
Fly Screens	100.00

(110) A number of supply houses should be invited to compete by submitting their best line of goods for the amount stipulated. They will submit designs and samples of the finish, at the architect's or builder's office, where the owner can make his selection.

PAYMENTS TO CONTRACTOR; GENERAL CONTRACTOR PROVISIONS.

Building is a cold business proposition involving much money and other valuable considerations. To insure best results all details should be handled on a strictly business basis. Both parties to the building contract should first thoroly understand and then scrupulously fulfill all their respective obligations.

Method of Payment on Contracts.

(111) The plans and specifications will show and call for the character of the work each contractor has to supply for the building and each contract will state what part of the work must be carried out before payment is made. As each contractor carries out his work satisfactorily from stage to stage, the architect issues a certificate which states that a payment is due according to the contract, and this the contractor presents to the owner for payment.

(112) The carpenter and mason contract should be drawn up for the general run of work as follows:

Contract for Carpenter and Mason work	$4,849.00
First payment:—When foundation walls, cellar and piazza piers are built, frame raised, sheathed, chimneys run thru roof, and roof shingled. (This is called "Rough Enclosure.")	$1,019.00
Second payment:—When all interior partitions are set, rough floors laid, sash in and brown mortar on	1,019.00
Third payment:—When the white mortar is on, the standing trim up, and the outside work 80 percent completed	1,019.00
Fourth payment:—When all the work called for by the plans and specifications is entirely completed to the satisfaction of the Architect	1,019.00
Fifth payment:—Thirty days after the fourth payment was due	773.00
	$4,849.00

(113) **Comment on First Payment.** The first payment calls for the cellar and piazza piers to be built; this is specially mentioned to prevent the girders which support the first tier of beams and the piazza work, being temporarily supported by shoring, which is undesirable. The chimneys are to be run thru the roof and flashed as the roof shingles are laid, which should insure a tight roof. If a builder knows he has to do the work in this order before he can get a payment, it is an assurance that it will be so done.

(114) **Comment on Second Payment.** Less than half the amount of the carpenter and mason contract should be made payable when the brown mortar is on the building, as the owner has only the building as security.

(115) The sash is specially mentioned in this payment in order to protect the plaster work against rain or frost; but if the plastering is done during hot weather, then it is best to change this and call for temporary muslin screens instead. The muslin of the screens should be dampened during the time the white mortar is being spread and drying out; otherwise it will dry too fast and crack.

(116) **Comment on Third Payment.** The brown mortar should be thoroly dry before the white plaster is put on. The standing trim means the door and window casings.

Description of Various Timbers.

(117) **Wood Sill.** A timber laid on top of foundation walls as a base for the wood frame.

(118) **Girder.** A heavy timber on which one end of the first floor beam rests.

(119) **Floor Beam.** The horizontal supports under the flooring (called joists).

(120) **Corner Post.** A timber 4 by 6 inches set vertical at the angles of the building to stiffen the frame. Where possible it is run in one length from sill to eaves plate.

(121) **A Stud.** A 2 by 4 or 3 by 4-inch timber, set vertically to form outside walls and inside partitions. The size of stud commonly used is 2 by 4 inches.

(122) **A Plate.** A plate is a 4 by 4-inch timber set horizontally on top of a number of vertical studs; the floor beams and studs of the second story rest upon it. Frequently the plate is made of two pieces 2 by 4 spiked together and into the top end of the stud.

(123) **Roof Rafter Plate.** Technically called "Eaves Plate." It is the highest horizontal plate in the building and rests on the studs forming the walls of the second story. The ends of the roof rafters also sit on the eaves plate.

(124) **Roof Rafters.** Timbers set on an incline from eaves plate to roof ridge to which the roof sheathing is nailed.

(125) **Ridge Piece.** A timber set horizontally at the highest point of the roof. The upper ends of the roof rafters butt against it on both sides, all are securely nailed together.

(126) **Braces.** Braces on the outside walls are set diagonally in a continuous line between a number of studs to stiffen the frame. They start from the sill on the first floor and the plates on the upper floors.

(127) Braces for inside partitions are cut in horizontal between the studs half way between the floor and ceiling beams.

(128) **Sheathing.** Boards ⅞ inch thick of various widths nailed to the studs to cover the outside of the building.

(129) **Shingle Lath.** 1 by 2-inch wood strips, nailed horizontally to the roof rafters, to which the shingles are nailed.

A TYPICAL SPECIFICATION EXPLAINED.

The following specification for mason and carpenter work is drawn up for the erection of a cottage building and is based on the floor plans illustrated on page 165. The notes in brackets are not part of the specifications, but are in explanation.

General Conditions.

(130) **Invitation to Estimate.** An invitation to estimate is given on the understanding that there will be no obligation pecuniary or otherwise incurred by the architect or owner.

[An owner has a legitimate right to choose a contractor who is not the lowest estimator, provided the contract is made for the amount of the estimate submitted. It is not honorable to ask a higher estimator to reduce his figure to that of a lower estimator.]

(131) **Interpretation of Drawings and Specifications.** The drawings and specifications are intended to explain and elucidate each other, and shall be equally binding upon the contractor. It must be understood that they call for a "complete job." The contractor shall supply and set all the materials

called for in the specifications and implied by the ¼ inch scale drawings. Should the drawings and specifications conflict as to any part of the work, the contractor shall ask for an explanation in writing from the architect before submitting his estimate; if he fails to do this, the architect shall decide what was intended.

[The expression "complete job" is necessary, as it is impossible to specify every nail or each individual part of the work.]

(132) **Dimensions on Plans.** Figured dimensions on the drawings take precedence over measurements by scale. The contractor shall check all measurements on the drawings before laying out the work.

[This is a check on clerical errors.]

(133) **Quality of Workmanship and Material.** All work and materials shall be judged according to the local standard for good work.

[It is advisable where possible, to select a finished building similar to what is desired and make this the standard.]

(134) **Builders' Supervision.** The contractor, or a competent representative, shall supervise the work and shall meet the architect at the site whenever notified. An experienced foreman shall superintend the work and remain constantly on the premises during working hours.

["Supervision" is competent and proper inspection, to ascertain if the work is being carried out according to the drawings and specifications. "Superintendence" is continuous personal attendance at the building.]

(135) **Condemned Work.** The contractor shall remove from the building or premises any material condemned by the architect, and shall take down any portion of the work which is unsound, not properly constructed, or which fails to conform with the drawings and specifications.

[Frequent inspections should be made by the architect to prevent unsound work being covered up.]

(136) **Protection of the Building.** The contractor shall protect the building during construction, and shall be held responsible until the building is accepted by the owner.

[This is protection against the weather, damage or theft.]

(137) **Scaffolding, Carting and Permits.** The contractor—shall erect the necessary scaffolding—do all carting of materials—obtain and pay for all permits and comply with all laws and ordinances.

(138) **Architect's Directions and Full Size Detail Drawings.** The contractor shall follow the directions given by the architect as the work progresses, and shall supply the exterior and interior woodwork, plaster, cement or metal work in accordance with the architect's full size detail drawings.

(139) **The Cutting for Other Mechanics.** The contractor shall do the "cutting" for the heating, plumbing and other contractors working on the building; he shall also "make good" after they have completed their work.

[It is customary for the carpenter to provide cleats for the plumbing and heating pipes, and cut the beams and studs over which pipes are to be set. This is called "the cutting for other mechanics."]

["Make good," is cleaning, or pointing plaster, stucco and concrete work or restoring any woodwork that has been damaged by the mechanics at work on the building.]

(140) **No Changes are to be Made Without a Written Order From the Owner.** No alteration shall be made in the work shown on the drawings or described in the specifications, without a written order from the owner. If additional work is required, an estimate shall be submitted, and if reasonable the amount shall be added to the contract price. Payment for additional orders shall be made upon completion of the building.

[Orders for additional work should not be given verbally, as it leads to dispute.]

(141) **Arbitration as to Extra Work.** In case an estimate for additional work should be considered exorbitant by the architect, each party to the contract shall appoint an arbitrator and the two chosen shall appoint a third. The parties to the contract shall agree to accept the decision of any two of them. Each party agrees to pay one-half of the expense incurred.

[This clause is intended to avoid litigation, if possible.]

(142) **Extension of Time.** In case of additional work being ordered it shall not invalidate the time clause, but a reasonable extension of time shall be allowed beyond the date set forth in the contract for completion.

(143) **Inspection of Building.** The contractor shall provide trade made ladders for the use of the architect and owner during construction, and when the white plaster is set a temporary open stairway shall be built from the first to the second floor.

[Ladders made on the job with 2″x4″ studs and shingle lath are dangerous.]

(144) **Accident Insurance Policy.** The contractor shall be held responsible for accidents to his men, delivery men, and damage to the adjoining property. He shall take out an accident insurance policy and submit it for inspection to the architect.

(145) **Indemnity Bond.** The contractor shall give a surety company's bond in the amount of 50 per cent of the contract price; to guarantee the faithful performance of the contract.

(146) **Fire Insurance.** The owner shall insure the building against loss by fire during the construction of the work.

[Buildings in course of construction are insured against fire on a sliding scale. If the completed building is to be insured for $7,500—when the frame is raised it is insured for $3,000—when plastered for $2,000 more—and when trimmed the balance.]

(147) **A Three Days' Notice.** Should the contractor at any time neglect to supply a sufficient force of workmen, or delay the work on the building, the architect as agent for the owner will serve a three days' notice upon the contractor. If he fails to comply with the terms of the notice, the owner shall be at liberty to take possession and provide the labor or materials necessary to complete the work, and deduct the cost of same from the balance due on the contract.

(148) In case the contractor is superseded, he shall not be entitled to receive any further payment until the entire work is completed. If the amount due under the contract exceeds the cost incurred by the owner in completing the work, the excess shall be paid to the contractor; but if the cost of completion exceeds the unpaid balance, the surety company will be liable to the owner for the deficiency.

(149) **Cleaning at Completion.** Before the owner accepts the building, all stains on the plaster and glass shall be removed, the windows cleaned and the building left broom clean.

Mason's Specifications.

(150) Specification of the work to be done in conjunction with the carpenter work. The cost of this work must be included in the carpenter's estimate.

(151) **Special Note.** The attention of the contractor is drawn to the notes written on the drawings, as they are part of this specification.

(152) All work shall be protected against the weather.

(153) Water required during the erection of the building shall be supplied, and the building heated if necessary by the contractor.

(154) **Excavating.** Before estimating examine the excavation made at the site. If there is good sand and gravel, it can be used in the construction of the building.

(155) The finished grading shall not be included in this contract.

["Grading" means spreading the surface soil evenly either level or to a pitch.]

(156) **Cement.** Portland cement of approved brand shall be used for all concrete, stucco or mortar.

[There are two kinds of cement and various brands of each; "Portland" cement, which is a manufactured cement, and "Rosendale," which is a natural cement.]

(157) **Trenches.** Dig trenches 2′ 0″ wide and 12″ below the finished cellar floor. Level off the bottom of the trenches ready for the concrete footings.

(158) **Concrete Work—Mixture.** Concrete for footings, walls, cellar and piazza floors, shall be composed of one part cement, two parts of sand and five parts of gravel, thoroly mixed with water and a water-proofing compound, brand of compound shall be approved by the architect.

[Concrete can be mixed with clean gravel or small broken stone.]

(159) **Footings.** Set boards 12″ high along each side of the trenches to hold back the earth, and pour in the concrete. The footings shall be 12″ thick and 24″ wide. Footings shall be laid under all walls, piers and chimneys. From each side of piers and chimneys the footings shall project 12″.

[The "footings" are a concrete base laid around the building. The foundation walls are built on the footings which spread the weight of the building over a larger area of ground, this reduces settlement.]

(160) **Foundation Walls.** Foundation walls shall be built plumb and true, and shall be of concrete 12″ thick. The concrete for the walls shall be poured into wood frames built by the carpenter contractor.

All foundation walls that are exposed after the grading is done shall have a ¼″ scratch coat and a dash finish to match the stucco on the other part of the building.

[If a light scratch coat is not spread over the exposed foundation walls, the lines caused by the wood forms will show thru the dash coat.

(161) **Cellar Floor.** Level off and tamp the entire cellar bottom—and lay concrete 4″ thick over the entire surface, over this spread a finish ¾″ thick of two parts sand mixed with one part cement and float smooth.

[If there is a water grid set in the cellar floor connected to a drain or cesspool, the floor of the cellar should be laid to a pitch from the side walls to the grid.

(162) **Kitchen and Laundry Hearths.** The kitchen and laundry hearths shall be of concrete, with a ¾″ floated finish.

(163) **Reinforced Concrete Templates and Chimney Cap.** Supply and set reinforced concrete templates for all piers—5″ thick, and the same area as the piers.

Supply and set chimney caps of reinforced concrete, projecting 1½″ beyond each side of the chimney stacks.

[The reinforcing can be done by setting wire cloth in the concrete.]

(164) **Mortar.** Mortar for brickwork shall be composed of three parts cement, two of lime and fifteen sand. Common brick mortar joints shall be "struck jointed." Pressed brick shall be laid up with red mortar and "jointed."

[A proportion of lime mixed in the mortar makes it spread better and is good in cold weather as it prevents the mortar from freezing.]

(165) **Brickwork.** Common brick required in the construction of chimneys, piers, hearth arches and trap basin, shall be good hard burnt brick. The piers shall be set up with a bond.

[Brick is laid in courses and set parallel with the wall in some courses and across the wall in others. This is done to interlock the bricks and is called "bond;" there are various ways of arranging the bond.]

(166) **Chimneys.** Build chimneys of brick and line all flues with unglazed tile pipe. Chimneys above the roof line shall be built of pressed brick.

[It is not advisable to stucco chimneys as it streaks the roof.]

(167) **Shield Wall Back of Kitchen Range.** At the back of the kitchen range, as indicated on the first floor plan, set a 4″ thick fire shield of pressed brick 6′ 0″ high and width shown on the drawings; finish on top with a bluestone cap with a tooled edge 5″ on bed and 3″ thick. The stone shall project one inch over the brickwork.

[The method of setting a cooking range between brickwork is seldom used, it is not as sanitary as the open set range.]

(168) **Piers.** All piers in cellar or piers shown outside cellar walls shall be built of common brick to the sizes marked on the drawings.

[Piers support the girders which in turn support the floor beams.]

Turn 4″ brick arches under the kitchen and laundry hearths.

[The brick arch forms a solid base for the hearth and prevents cracks in the concrete.]

(169) **Trap Basin.** Build a brick box around the drain trap in cellar with a 3″ bluestone flag cover.

[This is necessary as in case of a stoppage in the drain, it is cleaned out from this trap.]

(170) **Mantel.** Include in estimate $75 net for a mantel, which will be selected by the owner or designed by the architect. Contractor shall also include for setting the mantel, hearth, jambs and the iron back.

[If a mantel from a stock mantel company is desired, $75 can be deducted from the contract price.]

Exterior and Interior Plastering.

(171) **Stucco.** The stucco shall be composed of five parts cement, twelve parts of sand, three parts of lime and a portion of wood fibre for the first (scratch) coat. This shall be spread over the entire outside walls and allowed to dry thoroly.

[An outside frame wall covered with stucco, is built of studs, sheathing, tar paper and wire cloth upon which the stucco is spread.]

A second coat of similar parts shall be spread over the first and allowed to dry. (Leave out the wood fibre in the second coat.)

The dash or finish coat shall be of sanded white cement with a mat finish.

["Mat" finish is medium rough, and is thrown on from a brush thru a wire screen.]

(172) **Lath and Plastering.** All inside walls, ceilings, partitions, staircase soffits, etc., shall be lathed and covered with two coats of patent plaster, when dry, a third coat of lime putty and plaster of paris shall be applied as a finishing coat.

Cellar ceiling shall be lathed and plastered one coat only.

["Soffit" means the sloping underside of the staircase under the treads and risers. Patent plaster is almost universally used if it can be procured, as it is better than the ordinary three coat work and costs about the same.]

Run all plastering down to floors.

[Plaster run down to flooring is a protection against vermin.]

Plaster lath shall be set ¼″ apart and metal corner beads shall be set at all angles.

[Plaster lath should be set ¼″ apart to allow the plaster to pass between the lath as it is being spread, which forms a key and secures it to the lath; it is cheaper to set the lath closer together as it takes less plaster to cover the wall.]

Cut out plaster cracks and do the necessary pointing up. Clean all marks off the plaster and floors after all other contractors have completed their work.

[The plaster will occasionally crack from the shrinkage of the timber and at parts where the building varies in weight, for instance: a heavy chimney stack adjoining a frame wall will settle, unless the footing under the chimney stack is wide enough to spread the weight equally. After settlement has taken place the cracks are pointed up.]

(173) **Tile Floor.** The floor of the second story bathroom shall be covered with hexagonal tiles set in cement on a concrete base.

[The concrete base is formed by setting round boards between the floor beams 4″ down from the top of the beam, the concrete is laid in these pockets and finished level with the top of the beam. Upon this base cement is spread and the tile set.]

(174) **Tile Walls.** The side walls in bathrooms shall be covered with white glazed tile 4′ 2″ high with tile cap and sanitary base.

The tile floor shall be cleaned with acid after all mechanics have completed their work on the building.

[Where side walls are to be tiled, metal lath should be set up to the top of the tile cap, as plasterer's lath is not strong enough to hold the weight of the tile.]

Rough Carpentry Work.

The contractor shall set all the rough timber and work necessary to complete the building; he shall employ skilled mechanics to erect and set the entire frame work, sheath the outside walls, shingle all roofs, set the window frames, cover the entire out-

side of the building with tar paper, lay the wire mesh over the exterior walls, set all interior partitions, lay the rough flooring, set grounds at all door openings for plasterers to work to, hang all sash, set all standing trim (casings) for doors and windows, build staircase, set the false ceiling beams and wainscot in dining room, hang all doors, set all finished hardware, lay the finished floors and set up all exterior finished woodwork. He shall supply and set mantels, glass, rough hardware, flashing, leaders and gutters, and all other material called for in this specification or shown on the drawings.

[This is intended to show the scope of the work to be done by the contractor.

"Grounds" are strips of wood that are nailed to the side of door openings and are set projecting beyond the plasterer's lath the exact thickness of the plaster; they are a gauge for the plasterer to work to. After the plaster sets they are removed.]

(175) The attention of the contractor is drawn to the notes written on the drawings, as they form part of the specification.

(176) **Wood Forms.** Build wood forms for the concrete foundation walls, and brace them securely to withstand the pressure of the concrete.

[The forms are made with studs and sheathing boards, braced to keep them vertical while the concrete is being poured and set; the studs and sheathing boards are afterwards used in the construction of the building. The studs are not cut in lengths to the height of the cellar wall, but are allowed to project above, so there is no waste.]

The Wood Frame of the Building.

(177) All framing timber and floor beams shall be of spruce. (Spruce, pine, hemlock and fir are used for the rough framework. The framework is thoroly protected and the woods are of about the same practical value. The kind generally employed in your locality should be specified.) The frame shall be firmly constructed in the following manner:

(178) **Spruce Girder.** Set a 6″x8″ girder to support the inside ends of the first floor beams, top of girder shall be 7′ 2″ above the cellar floor, running in a continuous line from the front to rear wall. The girder shall be supported by the foundation walls at the front and rear, also by intermediate brick piers on 6x8 sound posts, set on a concrete base, not more than 8′ 0″ apart.

(179) **Wood Sill.** Set a 4″ thick and 6″ wide wood sill embedded in cement on top of and around all the foundation walls. The sill shall be set 1⅜″ back from the outside face of the wall, so that the outside face of the stucco will be continuous to grade. Sills shall be halved together at the angles of the building.

[The sill is the wood base on which the entire frame rests. The outside faces of the studs are set flush with the outside face of the sill. The sheathing (⅞″ thick) covers both—the stucco on the frame is one inch thick, and the skim and dash coat on the exposed foundation wall is ½″ thick—this will produce a continuous surface.

"Halving"—when two pieces of timber are to be fastened together, with the upper side of both on the same level, each piece is cut half way thru and one laid over the other.]

(180) **First Tier of Beams.** Upon the wood sill on one side and the supporting girder on the other set the first tier of beams—notching them down about one inch to bring them top flush, and space them 16″ from center to center.

Set a 2″x8″ floor beam against the outside end walls instead of a 2″x10″ beam, to clear the wood sill.

Place double beams under all cross partitions, and set the studs for the cross partitions on these beams.

[This is to carry the weight of the plastered partitions.]

At each side of the chimney stacks and staircase opening, set double floor beams.

[These are called "headers."]

At right angles, set double beams between the headers.

[These are called "trimmers."

Headers and trimmers at a chimney form the space for a hearth, and at a staircase opening provide the headroom.]

If the trimmers are over 4 feet long, hang them on wrought iron stirrups

["Stirrups" are used to prevent weakening of the header by cutting into it to receive the ends of the trimmer beams.]

Fill in the space between the headers with floor beams, and mortise and tenon them to the trimmer beams.

[A "tenon" is a 2″ x 2″ piece which is left in the center of the end of a floor beam after a piece has been notched out from the top and bottom of the beam. This projecting piece is set into a 2″ x 2″ hole (called a "mortise") cut thru a beam sitting at right angles to the beam with the tenon on it; this fastens them together. They are spiked in addition. By this method of framing the top of the beams are all level.]

(181) **Bridging.** All beams shall be bridged, one row to each span.

Bridging shall be set before the rough floors are laid, nails shall be half driven, later, when settlement has taken place and before the ceilings are lathed, drive in the nails.

["Bridging" is set between floor beams; it consists of 2″x2″ pieces set in the form of a cross (X). Each is nailed to the top edge of one beam and the bottom edge of the other beam.]

(182) **Corner Posts.** Set vertically on the sill a 4″x6″ corner post at each angle of the building, well spiked to the sill, and temporarily brace it to keep it in position. Corner posts shall be in one length from sill to eaves plate where possible.

(183) **Studs Against Corner Post.** Set vertically 2″x4″ studs 10′ 0″ long against the corner posts, and spike them securely to the post.

[This will make the height of the rooms 9′ 3⅛″ from finished floor to plaster face of ceiling.]

(184) **Second Story Plate.** Using the upper end of the studs (set against the corner posts) as a bearing, set the 4″x4″ second story plates horizontally around the entire building; fit the plate ends close to the corner posts, and spike securely.

(185) **Studding.** Between the wood sill and the second story plate, set vertically, 2″x4″ studs 16″ from center to center driven in tight. Set double studs at door and window openings. Nail the ends of studs to the sill and plate, and wherever possible nail the studs to the floor beams to form a tie across the building.

(186) **Second Tier of Beams, Studs, Etc.** Set the second tier of beams in a similar manner to the first tier; notching them down and framing with headers and trimmers around staircase opening and chimney stacks. Set vertically, 2″x4″ studs 10′ 0″ long against each corner post, and on the upper end of these studs set the eaves plate 4″ wide and 3″ high. Fill in between the second story plate and eaves plate with studding and double the studs at all window openings.

[This will make the height of the room 9′ 3⅛″ in the clear.]

(187) **Second Story Ceiling Beams.** Set the 2″x6″ second story ceiling beams on the eaves plate at one end and on the inside partition at the other end.

(188) **Roof Rafters.** Set one end of the roof rafters on the eaves plate and the other end against the ridge piece, spike them securely at both ends. Rafters shall be set 20″ from center to center.

(189) **Roof Framing.** Frame the roof as shown on the elevations. Set 2″x10″ rafters at all hips and valleys, and frame for saddles at the back of all chimneys.

[A ''saddle'' is formed to prevent rain water lodging at the back of the chimney.]

Set ⅞″x10″ boards along the valleys.

[A ''valley'' is the inside angle formed by the joining of two planes of a roof.]

(190) **Shingles.** Cover all roofs shown on drawings with shingles, forming Boston hips and ridges.

[''Hip'' is the outside angle formed by the joining of two planes of a roof. ''Boston hips'' are formed by setting an edging of shingles at right angles to the line of the hip or ridge.

A ''ridge'' is the top line of a roof formed by the meeting of the sloping sides.]

Shingle Nails. All shingles shall be set with galvanized shingle nails.

[Nailing is important. Copper nails and copper-coated nails also are used. The nails, rather than the shingles, determines the life of the roof.]

(191) **Deck Roofs.** Deck roofs shall be covered with heavy canvas painted on both sides.

[A ''deck roof'' is a roof with just enough pitch to shed rain water to the gutter.]

(192) **Rough Floors.** Lay rough floors diagonally over the entire first and second floors.

[Rough floors are laid diagonally, as the rough and finished floors should not be laid in the same direction; if the rough floor is laid diagonally, the finished flooring can be laid in either direction.]

(193) **Rough Heads and Sills.** Between the double studs at door and window openings, set rough heads and sills—size 4″x4″ (2″x4″ doubled). The heads shall be set on the top of one of the vertical studs on each side of the opening, and between the top of the head and the plate set in a 2″x4″ piece driven tight.

(194) **Braces.** Cut in 2″x3″ horizontal braces at half heights in all interior partitions. Set 2″x3″ braces in the outside partitions in a continuous diagonal line between the studs.

[Braces stiffen the walls, and prevent the plaster cracking.]

Trussing Over Doors and Windows. Truss over door and window openings that support floor beams

[''Trusses'' are diagonal pieces set to transfer the weight over the center of the doors and windows to the double studs at the side of the opening.]

(195) **Furring.** Fur down part of the ceiling under bathroom 12″ where directed or necessary to give room for plumbing pipes,

[''Furring'' is framing down to give extra space.]

(196) **Construction of Exterior Walls.** The outside walls shall be constructed with vertical studding covered with horizontal sheathing, over which lay two ply tar paper, secured with plasterer's lath nailed on vertically at the joints of the paper. Over the entire exterior surface set 22 gauge wire cloth with V bars. Set metal beads at all corners of the building. The stucco shall be spread over the wire cloth. (For stucco see Mason's Specification.)

[Tar paper is a stiff paper saturated with pitch. Two ply means two sheets pressed together.

Gauge is the diameter of the wire forming the cloth. The gauges used for outside stucco are 20, 22, 24 and 26. 20 gauge has the largest diameter and the 26 the smallest.

''V'' bar is a continuous horizontal stiffening bar formed like a V, which allows a key for the stucco between the wire cloth and the sheathing.]

Summary of Timber Sizes.

(197) Floor beams 2″x10″ set 16″ on centers.
Girders under first floor beams 6″x8″.

Beam bridging 2″x2″ two rows to each span.
Sills 4″x6″.
Corner posts 4″x6″.
Studs 2″x4″ set 16″ on centers.
Door and window studs 2″x4″ doubled.
Plates 4″x4″.
Roof rafters 2″x6″ laid 20″ on centers.
Ridge piece 2″x8″.
Shingle lath ⅞″x4″ or ⅞″x6″ set 5″ on centers.
Shingles 18″ red cedar shingles.
Sheathing ⅞″ x 8″ T. & G.
Rough under floors ⅞″x8″ T. & G.
Piazza rafters 2″x6″ set 20″ from center to center.
Piazza girders two 2″x10″.
Piazza beams 2″x8″.
Horizontal furring for piazza ceilings 2″x4″ set 16″ from center to center.

[The piazza rafters slope and the piazza ceiling is horizontal, so the furring is necessary for nailing. T. & G. is Tongued and Grooved. N. C. pine is North Carolina Pine.]

Exterior Trim and Cornice.

(198) **Cellar Window Frames.** Supply and set cellar window frames made out of 3″x4″ white pine with half-inch rabbet to receive the hinged sash.

(199) **Box Window Frames.** All the windows shall have white pine box frames, made with 1⅛″ pulley stiles, 2″ rabbeted sills, ⅞″x8″ check sill, 1⅛″x4½″ blind stop and ½″x1″ parting strip.

Flash around outside of window frames with two-ply tar paper and make them weatherproof.

[Box frames are constructed to hold weights which balance with the sash and are necessary to make the sash work easily.

A ''pulley stile'' is the face of the box frame against which the sash slides.

A ''rabbet'' is a channel sunk on the edge of the sill.

A ''check sill'' is set over the heavy sill.

A ''blind stop'' is the wood trim which shows on the exterior of the building around all window openings.

A ''parting strip'' is the projecting nib between the two sash.]

(200) **Sash.** All sash thruout shall be of white pine 1½″ thick and double hung.

[White pine is universally used for sash as it does not warp.]

(201) **Glass.** Glaze all window sash thruout. Include for glass in entrance to main hall and French casement doors between rooms.

Glass shall be strictly first quality, and shall be clear and well tacked and puttied.

All rabbets shall be painted one coat before the glass is set.

[''Rabbet'' is the jog in which the glass is set. If the rabbet is not painted the putty will fall out.]

All glass shall be ''double thick American'' except that in basement, which shall be ''single thick American.''

Kitchen door upper panel shall be glazed with ¼″ plate glass.

[Single thick glass is suitable for basement windows or small panes. It is about 1/16 of an inch thick. Double thick glass is suitable for large panes up to 3′x3′. It is about ⅛ of an inch thick. Plate glass is a fine grade of glass, very clear, suitable for large windows. It is ¼ of an inch thick.]

(202) **Exterior Woodwork.** Exterior woodwork shall be of clear white pine for cornices, soffits, facia work and mouldings, and shall be made in accordance with the architect's full size detail drawings.

[White pine is specified for exterior woodwork—as it is good for the purpose. Cypress is very serviceable and costs less.

A ''cornice'' is a project moulding composed of several parts.]

All soffits of cornices, gable rake and other projections shall be ceiled up.

[A ''soffit'' is the underside of a projecting cornice.

A ''facia'' is a board which is to be exposed in the finished work.

''Mouldings'' are wood strips shaped to certain forms.

A ''gable'' is the triangular form of roof.]

(203) **Door Frames and Jambs.** Front and rear doors shall have 1⅜″ rabbeted jambs of white pine with 2″ sill.

All inside door jambs shall be 1⅛″ thick with ½″ rabbet for door.

[''Rabbet'' is the jog in the door frame which receives the door when closed.]

Inside Trim (Door and Window Casings).

(204) **Back Band Trim.** Trim all door and window openings thruout all floors with a trim made up as follows: First a flat piece of trim ⅞″x4½″ with moulded edge, the moulded edge shall be worked as the window stop in the window trim. This flat trim shall be set with a horizontal joint at the head of each door and window. Against the flat trim set a back band ⅞″x1¾″, and at joint of the flat trim and back band set a mould ¾″x⅞″.

[''Trim'' is the wood casing set as frame around doors and windows.

''Back band'' is part of the trim. It is set against the plaster and the flat part of the trim.

''Window stop'' is the strip of wood set against sash to hold the lower sash into place.]

Set a ½″x½″ wall mould at the intersection of the back band and plaster face; it shall be run all around each opening and on top of the base board around each room.

["Wall mould" is a small bead to cover the joint of the wood trim and the plaster.]

(205) **Stools and Aprons.** All windows shall have 7/8" stools and 7/8"x4" moulded aprons.

[A "stool" is the inside window ledge. An "apron" is the moulding set against the plaster under the stool.]

(206) **Moulded Trim.** All trim shall be moulded in accordance with the architect's detail drawings.

(207) **Base Boards.** Set a moulded base board around each room 7/8"x8" high—the wall mould of trim shall be run on top of the base. Set a 6" base board with beveled edge around all closets.

(208) **Hardwood Trim.** Trim of living room, dining room and hall shall be of plain oak (or other hardwood as may be preferred).

[Quarter-sawed oak can be used, but it is more expensive.]

(209) **Second Story Trim (Door and Window Casings).** Trim of second story shall be of white pine (or other wood desired).

(210) **Trim of Kitchen, Butler's Pantry, Etc.** Trim of kitchen, butler's pantry and servant's bedroom shall be of white pine.

[White pine is specified for the working department; it makes a good base for paint. Varnished woodwork is not good as it discolors quickly.]

Doors.

(211) **Single Doors.** All interior single doors shall have five horizontal panels, blind tenoned and a mould worked on stiles.

["Stile" is the heavy frame of a door.

"Tenon" is a 3" piece of the horizontal door stile, which is sunk into the vertical stiles to hold them together.

"Blind" means that the tenons must not pass clear thru the vertical stiles as they would show on the edge of the door.

A "panel" is the part of a door between the horizontal and vertical stiles.]

(212) **Front Entrance Door.** Front door shall be 2" thick, with sash as shown on the drawings and made of the same wood as the trim in the hall.

["Sash" in a door means there is to be a glass panel or panels.]

(213) **Side and Rear Doors.** Side and rear doors shall be 1¾" thick, with sash in the upper panel.

(214) **First Story Doors.** First story doors shall be 1¾" thick, French casement doors 1¾" thick, with astragal on both sides.

["Astragal" is a strip of wood set on the edge of one of a pair of doors to cover the meeting joint.]

(215) **Second Story Doors.** Second story doors shall be 1¾" thick, birch veneered. Closet doors shall be 1½" thick.

[Stock birch veneered doors can be purchased at a lower figure than the ordinary doors can be made by the average mills.

"Veneer" is a thin surface of wood glued to a central wood core; most hardwoods, if used in heavy pieces, warp and are not suitable for doors. It is better to have a door made of white pine and veneered with wood to match the finish of the rooms.]

Staircase.

(216) Build staircase from first to second floor of plain oak as follows:

Strings 1¾" thick, treads 1⅛" thick and 10½" wide, risers 7/8" thick and 7½" high, with projecting nosing and mould under nosing. Treads and risers shall be housed into strings, wedged and glued together.

(217) **Carriages.** Set a 4"x6" carriage under the center of the staircase to stiffen the treads and risers.

["Strings" are the wood supports on the side of a staircase into which the treads and risers are set. If the steps up the staircase are to show on the side it is an open "string"; if they are not to show it is a closed "string."

A "riser" is the vertical piece between each tread. A "tread" is where the foot is set. A tread always projects over the riser—the projection is called the "nosing" and a mould is set under it.

"Housing"—a groove cut in the strings to receive the ends of the treads and risers.]

(218) **Newels.** Main newel shall be 6" by 6" paneled and moulded with moulded cap. Balance of newels shall be 4"x4" paneled and moulded as per detail drawings.

[A "newel" is a vertical post which receives the handrail.]

(219) **Handrail and Balusters.** Moulded handrail shall be 3½"x4½", with ramps to newel posts.

["Handrail" is the sloping rail for the hand.]

Set two balusters on each step 1⅜"x2⅞" sawed out as per detail drawings.

[The curved part of a handrail where it strikes the newel post is called the "ramp."]

Include for facias and turned rosettes where the handrail ends against the wall.

(220) **Cellar Stairs.** Build cellar stairs with 1¾" strings, 7/8"x8½" risers, 1⅜"x9½" treads of yellow pine, with round handrail and square newel.

Special Interior Finish.

(221) **Dining Room Wainscot.** Set in dining room a paneled wainscot, height 5' 6" from finished floor to the top of cap, built two panels high with vertical stiles as near 18" on centers as the breaks in the room will allow. Stiles 7/8"x3" with a ½"x½" mould run around each panel.

["Stile" in this case means the vertical and horizontal pieces into which the panels are set.]

Run an 8" moulded base at the bottom of the wainscot, and a 1¾"x4" moulded shelf as a cap,

with sawed out brackets 1⅞″ thick set over each stile.

(222) **Wood Cornice in Entrance Hall.** Set a 6″ wide and 6″ deep wood cornice at intersection of ceiling and side walls in the entrance hall.

(223) **False Ceiling Beams.** In living room and dining room set false ceiling beams as indicated on the plan—size 6″x8″ with a crown mould 2″x2″ set at intersection of the false beam and the plaster of ceiling. Set a half beam around all side walls with a crown mould, and a bed mould set at intersection of the underside of the false half beam with the vertical plaster wall.

[False ceiling beams are set over the finished plaster ceiling, and do not support the floors above.

A bed mould is always set at the intersection of a vertical and horizontal plane.]

The wainscot, ceiling beams and cornice shall be of plain oak and according to the detail drawings.

(224) **Flooring.** Lay flooring on all floors of combed grain longleaf pine T. and G., blind nailed, measuring 2½″ between the exposed joints when set.

[''Combed'' means edge grain, or quarter-sawed.]

All floors shall be scraped before the painter starts his work.

[Scraping of floors is necessary to bring all the boards even.]

Closets.

(225) **Bedroom Closets.** All bedroom closets shall be trimmed with 4″ mitered beveled edge trim on the inside and shall have two shelves, one on top of base, and one 5′ 6″ up from finished floor. Set a pole 2″ diameter from wall to wall for clothes hangers; pole shall be set at each end on a moulded wood disk sunk to receive the pole, one disk to have groove to remove pole when desired.

(226) **Store Closets.** Linen, kitchen and laundry closets shall have four shelves full depth of closet.

(227) **Dressers.** Build and set dressers in kitchen and butler's pantry with 1⅛″ top and three drawers under the top. On one side of the dresser continue with drawers to the base, and the balance of the space under the dresser top shall be made into closet space with wood panel doors and shelves. Upper part above the dresser top shall have three rows of shelving for china enclosed with hinged glazed doors and supplied with cleats and hooks complete.

Dressers shall be 7′ 6″ high of width and depth shown on the drawings.

(228) **Drip Boards.** Kitchen and butler's pantry sinks shall have 1⅛″ grooved drip boards of ash, size shown on the plan.

[Ash is the best for drop boards; it does not discolor as readily as other woods.]

(229) **Boxing Pipes.** Supply board supports required for plumber's pipes and box in soil or waste pipes where exposed. Front of box shall be secured with screws.

[Screws are used so the front can be easily removed when necessary.]

(230) **Plaster Guards.** Set guards on all exposed plaster corners.

[''Guards'' are of wood and set on the outside plaster angles as a protection.]

(231) **Door Stops.** Set rubber tipped stops to all doors.

[These stops are set on the base board to prevent the door handle damaging the plaster.]

(232) **Picture Mould.** There shall be picture moulding ⅞″x1½″ in all rooms and set where the architect directs.

[The picture mould should be set at the intersection of side wall and ceiling.]

(233) **Clothes Posts.** Include for four turned clothes posts in yard.

(234) **Boxing of Rough Wood.** Box in all rough wood around side entrance and finish with facias around plaster wall.

[This is to cover up any rough edges of plaster or exposed rough timbers.]

Cellar Woodwork.

(235) **Coal and Wood Bins.** Build coal and wood bins, size of each shall be 8′0″x10′0″ made of T. and G. dressed boards 5′ 0″ high with studs run to ceiling beams at all angles.

(236) **Trunk Platform.** Build a platform 1′ 6″ high from cellar floor for trunk storage.

(237) **Storage Closet in Cellar.** Build a storage closet 8′ 0″ x 8′ 0″ of ⅞″ 2½″ dressed slats set ¼″ apart and run from floor to ceiling, with slat door and padlock. Set four lines of shelving around three sides of closet.

[Slats are used to ventilate the basement closet. Dressed is planed smooth.]

(238) **Metal Weatherstrips.** Metal weatherstrips are to be set on all windows thruout.

Include the sum of one hundred ($100) dollars for this work; the owner reserves the right to give out this work direct and deduct the one hundred ($100) dollars from the contract price.

(239) **Window Easing.** Contractor shall ease all windows and doors at entire completion

[This is to make the windows and doors fit and work easily.]

(240) **Cleaning.** Scrape stains off glass and have same cleaned and leave everything in perfect working order.

(241) **Fly Screens.** Fly screens are not to be included in this contract.

[It is best to have the manufacturers of fly screens figure separately as the builders profit is saved and they install them complete. Full length outside screens are recommended as ventilation can be had from the upper and lower part of a window at the same time.]

HARDWARE AND HEATING.

"Finish" Hardware.

(242) The "finish" inside and outside hardware shall be of standard manufacture, of solid brass or bronze, except in the kitchen and basement, which shall be of iron bronze. Samples shall be submitted to the architect and owner for approval.

(243) Furnish and set all "finish" hardware needed thruout the house, including door hinges, locks, door handles, door plates, escutcheons, catches, bolts, sash fasteners, sash lifts, drawer pulls, hooks for all closets, hinges and push plates for double action doors, lever bolts for French casement doors, dead locks, sash pulleys, all kitchen, butler's pantry and basement hardware.

(244) There shall be two 4″x4″ butts set on all doors with steel bushings and tips. The front entrance and sun parlor doors shall have three 4½″ x4½″ butts.

["Butts" are the hinges.]

(245) Sliding sash thruout shall be hung with heavy braided sash cord to cast iron weights run over noiseless steel pulleys, with electro plated bronze faces.

(246) All windows shall have double action sash fasteners.

(247) Set two counter sunk sash lifts on the bottom of the lower sash of each window.

(248) Set the door knobs a convenient distance away from the door jambs.

[This is to prevent injury to the hand.]

(249) **Locks.** Locks for all inside doors shall be three tumbler mortise locks, size 3½″x3″ with face finished to match the hardware in each room.

Set mortise locks on back entrance and grade doors.

On the outside of front and sun parlor doors set pull handles with thumb latch and octagon lock escutcheon. On the inside set 2½″ glass knobs, dead bolts with 1¼″ knobs and night latch.

[This is the most modern outside door hardware. The most serviceable finishes for the hardware are old brass and antique copper. Manufacturers supply a variety of finishes, samples of which can be obtained from any hardware dealer.]

(250) This is a general specification of what is required. The owner reserves the right to deduct the net sum of one hundred and thirty ($130) dollars from the contract price and supply the hardware, which the carpenter contractor shall set. The contractor shall supply and set all rough hardware.

[Rough hardware consists of nails, stirrups, bolts, sash weights, etc., that are not exposed and are part of the construction.]

Sheet Metal Work.

(251) Furnish and set flashings required of the best tin, brand of which shall be approved by the architect. The flashings shall be well fitted, blocked, tacked and soldered.

(252) Flash over all window heads, step and cap, flash all chimneys, flash for roof, projecting mouldings and cornices. Valley flashings shall be 20″ wide. All flashings shall be painted on both sides before setting.

["Flashings" are pieces of tin or other metal, which are inserted at joints to make them watertight. The tin is stepped into the mortar joints of a chimney and turned under the shingles. "Cap flashing" is set a brick course higher and covers the joint of the step flashing.]

(253) **Gutters.** Furnish and set with proper incline, 4″x6″ No. 24 gauge galvanized iron hanging gutters with ¼″ rods inserted at upper edge and iron supports on each rafter.

[A "gutter" is a metal channel to catch rain water as it flows from the roof.

Rods are used to stiffen the edge of the gutter.]

There shall be gutters at all eaves of main roof and piazza roof.

["Eaves" are the edges of the main roof where it hangs over the outside walls.]

(254) **Leaders.** Furnish and set eight (8) 3″x4″ No. 24 gauge corrugated galvanized iron leaders, secured to outside walls with wrought iron holdfasts and connected to all gutters.

["Gauge" is the thickness of the metal. No. 24 and No. 26 are the usual gauges for this purpose. No. 24 is the thicker.

"Corrugated" means evenly crimped.]

All leader heads shall be "swan neck," and where possible the leaders shall be run straight and at a sufficient distance from the walls to clear small projections. The leaders are to be run down to a point 1′ 0″ from the grade, and from this point the plumber will connect them to his work.

[Copper for flashing, leaders and gutters is more durable than galvanized iron, but is much more expensive.]

General Recommendations.

The following information is intended as a guide and is not given in specification form.

Hot Air Heating Plant.

A hot air heating plant supplies fresh heated moist air. The working of this system is simple. The furnace should be located toward the northerly end of the cellar, as it is difficult to heat rooms that are exposed to cold winds. By this method the pipes can be run direct to the rooms above the furnace.

Steam Heating Plant. A steam heating plant is easily installed, reasonable in cost and gives efficient heat.

Hot Water Heating Plant. A hot water heating plant produces an even degree of temperature and can be regulated during mild weather, which saves coal. The initial cost of installation is from 25 to 33 percent more than a steam plant.

Difference in Size Between Steam and Hot Water Radiators. The size and number of columns in the radiators determine the amount of radiation. If the height of the radiators is lowered it will increase the number of columns. Each column of a steam radiator is heated to the temperature of the steam—212° F., or nearly so. Therefore when a hot water plant is used, larger radiators are required than for steam, as the water is only heated up to hot water temperature—from 150° to 180°.

Steam and Hot Water Heating Plants.

Hot water and steam radiators should be placed under or near the windows to warm the cold air from the glass surface.

The radiators should not be located under electric lights or in the spaces provided for furniture.

Locating Boiler. The boiler should be centrally located to bring the mains run below the cellar ceiling as nearly equal in length as possible, so that all parts of the house will be uniformly heated.

Drainage of Mains. The mains should have sufficient pitch to return the condensed steam or water back to the boiler.

Definition of Radiation. The expression "amount of radiation" is used to define the heating surface required to heat a building to 70 degrees F. in zero weather.

Definition of Heating Surface. "Heating surface" is the surface of the columns which form the radiator.

Quantity of Radiation. The amount of radiation needed to heat a house satisfactorily depends on:

1st: The area of glass surface in the windows.

2nd: The exposure of the building to the points of the compass.

3rd: The size of the rooms and the height of the ceilings (cubical contents of the rooms).

Capacity of Boiler. The capacity of the boiler should be about 50 percent greater than the amount of radiation needed to heat the house, as it is more economical and safer to work a boiler of large capacity with a small fire, than to force a small boiler with a large fire.

Exposed Pipes. All heating pipes should be exposed to obtain the best efficiency. The supply mains and boiler should be covered with an insulating asbestos covering to prevent unnecessary radiation of heat in the cellar.

Contractors' Guarantee. The contractor for the heating plant should guarantee to heat all rooms of the house to a temperature of 70° Fahrenheit in zero weather.

Efficiency of Well-Designed Boilers. A boiler made and guaranteed by a standard and reliable company will prove far more economical than an inferior one. The additional initial cost will soon be outbalanced by the saving in coal.

Care of Heating Plant. Keep the grate bars clear by using the shaker twice a day—the ashes must not be allowed to accumulate as they will burn out the grate bars. Use small coal—it burns readily and makes few ashes. The furnace should not be loaded with coal above the bottom of the door.

Chimneys. To insure the proper working of a heating plant it is necessary to have a well constructed chimney of ample area and height. The flue linings should be 8½"x13" or 10" diameter (outside dimensions).

Method of Determining the Amount of Radiation Required for Rooms.

The following is the method usually employed to ascertain the radiation required to heat a room to 70 degrees Fahrenheit in zero weather:

1st—Determine the cubical contents of the room: Multiply the width by the length and multiply this product by the height; this will give the cubical contents. Divide the cubical contents by 200.

2nd—Multiply the length of the outside walls of the room by the height. Divide this product by 20.

3rd—Multiply the width of each window by its height and add the products together; divide this by 2.

4th—Add together the sums of each of the above results and the total will be the number of square feet of direct radiation necessary to heat the room.

Illustration.

To ascertain the amount of radiation necessary to heat a room 14 feet by 14 feet and 10 feet high; with two outside walls, each wall having two windows size 3' 0" x 6' 0".

	Sq. Ft. Rad.
(1) Cubical contents of room.	
14' 0" × 14' 0" × 10' 0" = 1960 cu. ft.	
Divided by 200 =	9' 8"
(2) Area of outside walls.	
14' 0" × 10' 0"	
14' 0" × 10' 0"	
28' 0" × 10' 0" = 280 sq. ft.	
Divided by 20 =	14' 0"
(3) Area of windows.	
2 (3' 0" × 6' 0") = 36' 0"	
2 (3' 0" × 6' 0") = 36' 0"	
Divided by 2 =	36' 0"
(4) Total	59' 8"

PLUMBING AND ELECTRIC WIRING PRINCIPLES EXPLAINED.

The following information about plumbing is intended as a guide, and is not given in specification form.

Plumbing.

Sanitary Code. Most cities and towns have a code of plumbing "Rules and Regulations" which define the kind and quality of material that must be installed in buildings. It also describes the method of installation, stating the weight and sizes required for the piping. Inspectors are sent to the building during construction, to ascertain if the work is being carried out according to the code.

If a building is to be erected in a territory where there is no established "Sanitary Code," it is ad-

visable to procure the code of the nearest town or city having similar sanitary conditions and follow it.

Sewer Pipes. It is customary for the plumber to dig the trenches in which the sewer and water pipes are laid—at the point where the sewer passes thru the foundation the cutting should be done without injury to the wall. After the pipes are laid the trenches must be filled in with earth and tamped down.

Water Supply. A connection is made from the stree water main for the house service by a ¾″ lead pipe, terminating at the property line with a shut-off valve enclosed in an iron curb box.

It is usual for the plumber to pay the water company for the connection to their main.

From the property line a galvanized iron pipe is run to a meter in the building, and from this the water is distributed to the various plumbing fixtures. The supply pipes should be protected against freezing. Pipes laid under tiled bathroom floors should be of lead, as in case of settlement the lead pipe will give to some degree and reduce the danger of breaking.

Lead pipes should not be embedded in the concrete upon which the tile floor is laid, as the action of the cement will corrode and weaken the pipes. The concrete will prevent the hot water pipe from expanding in its diameter, which may cause leaks.

Back Air or Vent Pipes. The back air or vent pipes are usually of galvanized iron, and are run above the roof to carry off foul odors and prevent syphonage.

Traps. Every fixture should be equipped with a trap or water seal, which is a precaution against odors.

Soil or Waste Pipes. The soil or waste pipes inside the building should be of extra heavy iron pipe.

Testing of Pipes. The water, gas, soil and vent pipes should be tested under pressure before they are covered over, to determine if the entire system is water and air tight.

Selection of the Plumbing Fixtures.

It is advisable to select the plumbing fixtures before the plumber starts his work. A catalog can be obtained from any plumbing supply house and a selection made from the photographic half-tones. As soon as the plumber is informed as to the type of fixtures selected, he can "lay out" his rough plumbing; locating accurately all waste, soil and water supply pipes, so that when the fixtures are set a very slight adjustment to the supply and waste outlets will be necessary.

If desired, the fixtures can be seen at the supply company's show-rooms. Any change in the selection should be made before the plumbing pipes are set in the building.

Iron Enameled Ware. Iron enameled bathtubs, sinks and lavatories are good, serviceable and reasonable in cost. The enamel may occasionally chip off in places, but the fixtures are indestructible. Iron enamel bathtubs are sold with one, three and five year guarantees, for which insurance the owner pays an additional sum in the cost of the fixtures.

Porcelain Fixtures. There is a degree of solidity and richness in bathtubs, lavatories, sinks and washtubs made of porcelain. There are commercially three grades of these goods—viz.: "A," "B," "C."

Classification of Porcelain Ware. Each fixture is graded as follows:

1st: Regularity of size.
2nd: Evenness of finish.
3rd: Uniformity of color.
4th: Absence of blemishes, cracks or chips.

Fixtures judged most perfect according to the above standards are classified as "Class A." Those with slight imperfections as "Class B," and the remainder "Class C."

"Class B" goods in many cases have slight imperfections that are hardly perceptible. The saving in cost by purchasing "Class B" goods is an item.

Location of Plumbing Lines. For economy the plumbing fixtures should be arranged with as few pipe lines as possible. Bathrooms should be placed over each other. Pantry and kitchen sinks should be grouped together and if possible located under the bathrooms above.

All pipes should be installed so that the fixtures can be readily cleaned. The water lines to each bathroom, kitchen and pantry should have separate shut-off valves in the cellar in case of leaks.

Nickel Pipe and Fittings. The exposed pipes and faucets should be of heavy brass nickel-plated. Poor plating wears off quickly and has to be replaced.

Bathroom Fittings. On the tile walls of each bathroom there should be placed:

Two glass towel bars about 30 inches long.
One glass shelf 18 inches long.
One combination soap dish and toothbrush holder.
One paper carrier.

The plumber should set these fixtures as it is difficult to drill the tile walls and set them securely.

Kitchen Ranges and Water Heating Equipment.

The following fixtures should be set in the kitchen:

A single oven coal range with upper hot closet for heating plates and warming food.

A gas range with three regular burners, one giant and one simmering burner—lower oven, end shelves and upper warming closet.

(If desired a combination coal and gas range can be installed.)

A 60-gallon galvanized iron boiler, set on an iron stand and attached to the water-back of the range.

A double copper coil gas hot water heater, attached to the kitchen boiler to obtain hot water for all the fixtures, when the coal range is not in use.

Instantaneous Gas Hot Water Heater. If it is desired to supply hot water instantaneously to the fixtures, a special gas water heater can be set in the cellar, which will automatically heat the water when a faucet is turned on, and when it is closed shuts off the gas.

Gas Pipe and Outlets. Gas pipe and fittings should be run to the outlets indicated for gas on the drawings, wrought iron pipe should be used and securely fastened to the studding.

To obtain the maximum efficiency and uniform pressure of the gas, the horizontal pipes must be set with a continuous pitch to drain back any water which may collect in the system.

If gas logs are required for the fire-place a shut-off valve must be provided and set on the hearth.

If desired, outlets can be left in the wood base for gas radiators.

Vacuum Pipe. A 2½″ wrought iron galvanized pipe should be run up from the cellar thru a central partition, leaving an outlet in the wood base on the first and second story halls for the vacuum cleaner.

Hose Connection. A garden hose connection should be provided at front and rear of the house with shut off valves in the cellar to prevent them from freezing in the winter.

Leader Connection. The rain water leaders should be connected by the plumber to the sewer or to casks.

ELECTRIC WIRING.

The following information regarding electric wiring is intended as a guide, and is not given in specification form.

The electric wires should be enclosed in iron pipes or flexible lead tubing, concealed in the walls or between the floors and connected to stamped metal outlets and switch boxes in the various rooms.

Number of Lights in Each "Circuit" or Branch. The location of the fixtures and the number of lights desired should be determined before the circuits are laid out. A circuit consists of twelve 16 candle power lights. A central distribution box is set in a convenient location in the building, to which the current is supplied from the outside. To this box the circuits are connected and the current is distributed to the fixtures in the building. Each circuit should be supplied with fuses and cut-off switch—in case any circuit becomes out of order it can be cut off without affecting the other circuits.

In arranging the circuits it is advisable to wire ten lights to each circuit, so that additional lights can be added if they are required at any future time.

Schedule of Electric Outlets for the Plans Accompanying. **See Page 165.**

Below is a schedule stating the number of electric fixtures, the number of lights in each fixture, and the necessary switches.

Center fixtures are secured to the ceilings.
Side brackets are secured to the side walls.

First Floor.

Location	Types of Fixtures	No. Lights in each Fixture	Switches
Piazza	Center	One	One
Entrance Hall	Center	Two	3-way
Living Room	Center	Four	One
Living Room	2 side brackets	One	
Living Room	Base receptacle	One	
Sunroom	Center	Three	One
Dining Room	Center	Four	One
Dining Room	2 side brackets	One	
Butler's Pantry	Side bracket	One	
Kitchen	Center	One	
Kitchen	1 side bracket	One	
Cellar	2 side brackets	One	One
Cellar	1 outlet for vacuum cleaner plant	Independent circuit	Two

Second Floor.

Hall	1 side bracket	One	
Main Bedroom	Center	Two	One
Main Bedroom	Dresser light	One	
Main Bedroom	2 side brackets	One	
Main Bedroom	1 base receptacle	One	
All other Bedrooms and Bathrooms, each	1 side bracket	One	

Extra Outlets and Switches. The schedule given can be modified to suit special requirements. It is advisable when drawing up the contract to stipulate a sum for which the contractor will install any additional side, center, base outlets and switches, in case the owner desires more than are included in the contract. Should any extra outlets be required they should be installed before plastering.

Combination Gas and Electric Fixtures. It is unnecessary to have combination fixtures for ceiling lights where the gas is used only in an emergency. Combination side brackets will be sufficient for use in case the electric current is temporarily shut off.

Switches. The switches should be of the flush push button type, with bronze or brass face plates to match the finish of the hardware.

A Three Way Switch. A three way switch when attached to a fixture controls the light from two points in the house. It is generally used on the light in the entrance hall, by which the fixture can be lighted when entering the house—put out from the second floor hall, and vice-versa.

A switch should be provided in the first and second floor halls to operate the motor of the vacuum cleaning plant in the cellar.

Base Receptacles. A base receptacle is an outlet provided for the use of portable lamps and vacuum cleaners.

Dressing-Table Light. The dressing-table light should be located about 3′ 0″ out from the side walls of the room and provided with a "chain pull" socket, which takes the place of a switch.

Purchasing Fixtures. Fixtures attractively designed and neatly put together materially help the appearance of the house.

A definite amount should be set for the purchase and installation of the gas and electric fixtures. Proposals should be obtained from a number of manufacturers describing the best fixtures each would supply for the amount stipulated. Samples of the actual fixtures can be seen in the manufacturer's showrooms.

Electric Bell Work.

Bells and Speaking Tubes. Electric bells with metal push buttons to match the hardware finish should be set with dampproof wire to batteries and annunciator in the kitchen, connecting with the front and rear doors, the dining room and second floor hall.

A buzzer should be set in the butler's pantry connecting with a floor push button under the dining room table.

For convenience a speaking tube is necessary from the second floor hall to the kitchen.

PAINTING AND FINISHING THE NEW HOME.

The following information is intended as a guide and is not given in specification form.

A house may be well built and all the carpenter work carefully performed, but its final appearance and attractiveness will depend largely upon the manner in which the painting is done.

Painting and Finishing.

Selection of Paints. The best and most durable ingredients and colors should be selected for the paint, as they are a protection for the exterior woodwork against the action of the weather.

There are special stains, of various colors and shades, made for interior woodwork, samples of which can be obtained from the manufacturers. It is unnecessary to choose the shades in advance, but the method of treating the woodwork should be specified. A clause should be inserted in the specification to the effect that the painter will submit samples of the paint colors and stains showing the quality of finish, before proceeding with any part of the work.

When the carpenter work is completed the painter should sandpaper the woodwork, set the nails and putty the holes.

Priming Coat. All outside woodwork after being set, should receive one coat of white lead and boiled linseed oil. This coat is called the "priming coat." The best white lead should be used in the paint, as it is the most important ingredient and will make more paint, cover more woodwork and give better lasting results than a poor quality of lead.

The rabbets of all windows and glass doors should receive one coat of paint before the glass is set; this will prevent the putty from falling out.

If a dark color is desired for the final coat on the outside woodwork, it is advisable to make the priming coat gray or buff; if a light color is desired, the priming coat should be chrome or white.

Finishing Coats. Three good coats of paint will make a substantial finish. The third and final coat should not be put on before the outside work of the building has been entirely completed. If pure white is selected for the finish, five pounds of French zinc mixed with every 100 pounds of white lead will make a brilliant finish.

The leaders, gutters, pipes, iron work and flashings should be painted with a coat of red lead, and followed with two coats of lead and boiled linseed oil of a shade to match the exterior wood trim. The red lead preserves the metal.

Inside Painted Woodwork. The finishing of inside woodwork in white or cream color for sunrooms, reception rooms and bedrooms is effective and readily restored.

A good serviceable enamel finish in white or cream can be obtained by the following treatment:

The door and window trim, moulding, base, doors, ceiling beams and any other woodwork that is to be painted should be sandpapered until smooth, then a coat of "filler" applied. When thoroly dry, the grain of the wood that has raised should be sandpapered down; after this apply two good coats of white lead and boiled linseed oil and finish with a coat of flat or glass enamel. If a still more durable and higher finish is desired, an extra coat of enamel can be applied.

Hardwoods (with the exceptions of cherry, birch, white wood, etc.) are not a good base for a paint finish, as the hard and soft grains of the wood do not absorb the paint equally, thus the finish is uneven.

Finish of Floors. After the floors have been scraped, a coat of "paste filler" should be applied and followed with two coats of shellac. The filler treatment is necessary as soon as the floors are scraped, but the shellac should not be applied until the inside work is entirely completed.

Varnish is not serviceable for floors; it cracks and turns black.

Piazza Ceilings. The piazza ceilings can be painted or varnished.

If a painted finish is desired a light color should be selected, either white or cream. If the roof of a piazza covers the windows of a room the white paint by reflection will increase the light.

If the piazza ceilings are to be varnished a coat of "filler" should be applied to close the pores of the wood, and followed with two coats of outside water resisting varnish.

Stained Woodwork. The interior hardwood should be prepared for staining by sandpapering until the surface is perfectly smooth.

A coat of acid or oil stain should then be applied

and immediately rubbed off with burlap. This is done to prevent the grain of the wood being hidden by the stain. The process can be repeated if the desired shade is not acquired by the first treatment. Follow this with a coat of "paste filler" which will close the pores of the wood and hold the stain.

For the finish two coats of rubbing varnish should be applied, rubbing down after each coat with pumice stone and oil until smooth. A coat of wax well rubbed down after this treatment will produce an eggshell gloss.

Decorating. The decorating of the plaster walls is seldom included in the painting of a new house. The composition of the plaster is such that a certain length of time is required for it to dry thoroly.

When the walls are decorated, either by painting or tinting, they should receive at least two coats of good varnish as a "size" before applying the finish. If the walls are to be papered they should be "sized" and covered with plain paper, after which the decorative paper is set.

The tints and paint colors should harmonize.

In Conclusion.

A few guiding remarks may help those who are about to build a home.

It is not advisable in private work to invite architects to submit competitive drawings, as the drawings are more or less misleading, particularly as to the cost of the building.

It is better to select an architect who has had experience in the character of the work desired and whose integrity is unquestioned and be guided by his advice.

To avoid any misunderstanding between architect and client, the architect's charges should be established before the order is given:

First. A percentage on the total cost of the building should be agreed upon for full services.

Second. If the work is abandoned the owner should agree to pay to the architect 1 percent for preliminary sketches and an additional 2 percent for the quarter scale working drawings and specifications. If the contract is closed the balance of the architect's commission shall become due pro rata as the builder receives his payments.

An architect's full services comprise:

Preliminary sketches, which should be reasonably supplied until the owner is satisfied.

A set of working drawings to ¼ inch scale, specifications, estimates, closing contracts, obtaining permits, supplying the full size detail drawings, issuing certificates of payment, supervising the work and auditing all accounts at completion.

The architect's charges being agreed upon, the general requirements of the building should be written down; setting forth clearly what is desired in each part of the house. If any particular exterior style is desired a photograph could be selected that would suggest the general effect.

On giving instructions to an architect it should be clearly understood by the owner that there are two methods of procedure.

First. The owner can give instructions as to the character of the desired building by establishing the sizes, heights, and the quality of the finish. From these instructions the architect can prepare a sketch plan and obtain an approximate estimate as to what the building will cost.

Second. The owner can set an amount for the entire cost of the building and the architect can prepare his drawing to bring the cost within the amount stipulated. If the latter way is adopted, it should be made clear what is to be included in the stipulated amount; this should be done from the data given on page 162.

It is unreasonable for an owner to give definite instructions as to the size and quality of the building and also to stipulate the amount to be expended, unless there is definite knowledge that such a building could be built for the amount.

CHAPTER XXII.

RELATION OF PLANS WITH SPECIFICATIONS

The reader has now gone over a regular working set of plans for a frame cottage, and there were but few special points that needed any explanation; while doing this it must have been noticed that the kinds and quality of the different materials and fixtures were not mentioned, except in one or two instances. All of this is left for the specifications to make clear, which generally state that the scale plans, together with the accompanying details including figures, notes, etc., are to co-operate with the specification in representing all that is required to make a complete and finished building of its kind.

The figures and dimensions on plans must be taken in preference to measurement by scale, and when general scale drawings and details disagree, the dimensions on the detail drawing should be followed.

Many architects also state in their specifications that the contractor will understand that nothing is to be omitted that is fairly implied on the plans or in the specifications as necessary to complete the building.

Read the Entire Specification.

Do not look simply at your own work in the specification, read it all, sometimes the specifications for plumbing say that the carpenter is to do all the cuting and repairing for the plumber, but no mention of this is made in the carpenter's specification. Finding it out first and getting it settled will avoid the wrangling that generally occurs in the final settlement. Avoid arguments.

As a practical test we give the complete plans for a larger house, also a perspective view of it and the specification for this building. In an earlier chapter the lumber, millwork and hardware bill were given.

SPECIFICATIONS

Of Labor and Materials Required in the Erection and Completion of the House Shown On Accompanying Plans (Map Insert—Homebuilder Model Bungalow)

(1) Superintendence—The contractor is to give his personal superintendence and directions to the work, also to have a competent foreman on the grounds constantly. He is to provide all labor, transportation, material, apparatus, scaffolding and utensils necessary for the complete and substantial execution of everything described, shown, or reasonably implied on the drawings and specifications.

(2) Plans and Specifications—The plans and specifications are to be considered co-operative and all work or material necessary for the completion of the design, drawn on the plans and not shown on the plans are to be considered a part of the contract and must be executed in a thoro manner with the best of material, the same as tho specified.

Detail drawings are to be taken in preference to drawings of smaller scale. The several drawings referred to are designated as follows:

Basement Plan.	Front Elevation.
First Floor Plan.	Rear Elevation.
Second Floor Plan.	Right Side Elevation.
Details.	Left Side Elevation.

The drawings and specifications are the property of the owner and are to be returned to him upon the completion of the work.

(3) Figures and Memoranda—Where no figures or memoranda are given the drawings are to be accurately followed according to their scale, but specifications, figures and memoranda are to be preferred to scale measurements in all cases of difference.

(4) Architect—The architect will, on request, furnish any additional details or directions required by the contractor. Every facility shall be given to the architect or superintendent to examine any part of the structure and material intended to be used.

(5) Material and Workmanship—All material and workmanship are to be of the best quality thruout. The building to be perfectly water and storm tight. The contractor is to carefully lay out all work and be responsible for any mistake he may make and other injury to others resulting from same.

(6) Faulty Material—All material delivered or work erected not in accordance with the plans and specifications is to be removed at the contractor's expense and replaced with other material and work, satisfactory to the owner at any time during the progress of the work.

(7) Safeguard—The contractor is to provide proper and sufficient safeguard against any accidents and is responsible for any damages to persons and property.

(8) Survey—The owner shall have the site surveyed and staked, furnish all necessary property lines and levels. The building is to be located as shown on diagram furnished by owner.

(9) Permits—The contractor is to obtain and pay for all necessary permits.

(10) Liens—The contractor is to keep the building free from liens during construction and to obtain and turn over to owner before final payment, proper releases from all material men and workmen.

(11) Extra Work—No extra work or material will be paid for except on a written order from owner.

(12) Changes—Should the owner at any time during the progress of said building desire any alteration of, deviations from, additions to, or omissions in the contract, and the same shall have the right and power to make such change or changes, and the same shall in no way injuriously affect or make void the contract, but the difference shall be added to or deducted from the amount of the contract, as the case may be, by fair and reasonable valuation.

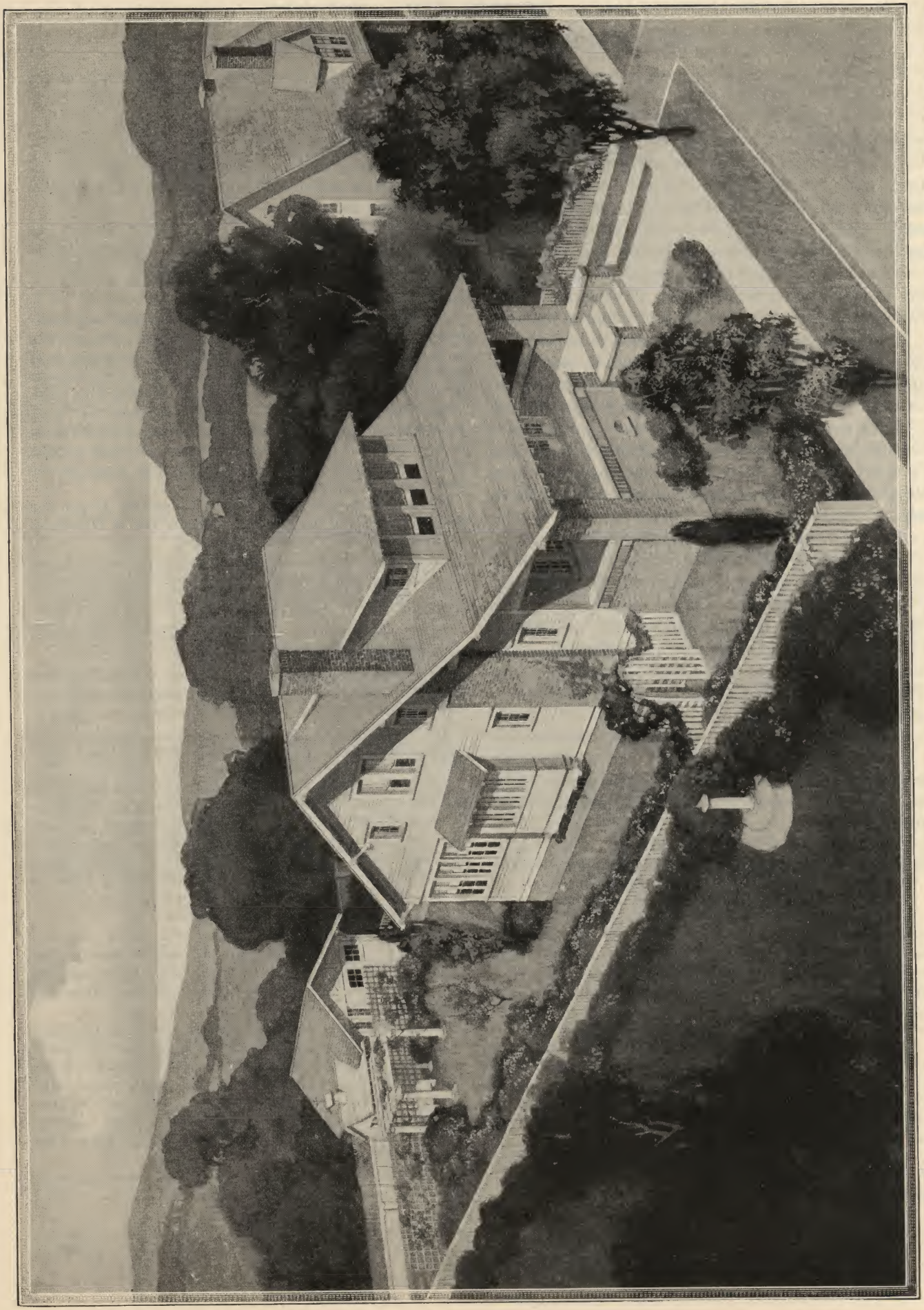
(13) Removing Rubbish—The contractor is to keep the place free from rubbish and waste material, to thoroly clean out the cellar, leave the floors broom clean before painting or staining, clean all window lights, woodwork, walls and brickwork.

(14) Established Grade—The grade line shown on the drawing is the line to which the lot is to be graded next to the exterior of the buildings, after the completion of the building.

(15) Excavating—Excavate to the full depth required and at least 8 inches wider all around than shown on the plan. All foundation walls and porch piers must in every case run down to a solid bearing and at least 6 inches below frost from finished grade line.

(16) Care of Top Soil—All black top soil must be placed separately from the remaining earth, for the use of final grading.

Fill in up to the established grade line under all porches, and up to foundation walls, sloping the earth away from building.



GENERAL VIEW OF THE "HOME BUILDER" MODEL BUNGALOW ON AN AVERAGE SIZE BUILDING LOT—SHOWING HOW ANY YARD CAN BE MADE BEAUTIFUL AT SMALL COST
Complete Working Plans of this Bungalow are Given on Map Insert, Design No. 6605. We can furnish blueprinted working plans of this building to any desiring them for only $8.00 per set.

(17) Footings and Foundations—All footings under all main walls, chimneys and piers, and 12-inch foundation walls up to grade, to be of concrete, composed of one part Portland cement, three parts sand and four parts crushed stone.

The concrete contractor is to thoroly waterproof both concrete basement floor and side walls by means of an approved method as agreed upon with the owner.

All concrete must be used as soon as mixed, and should any concrete start to set before it is in its place the same must not be used in any way. All concrete walls and piers must be run up, true, plumb, square and level and must be complete and perfect in every respect.

(18) Brick Work—All brick used about the buildings and in chimneys, unless otherwise specified, to be the best hard burned local market brick, laid wet, if laid in warm, dry weather, and dry, if in cold weather. All brick to be laid in fresh lime and sharp sand mortar. Four-inch brick arch laid in front of chimney fireplace and plastered smooth to receive tile. All smoke flues to be lined from bottom to above roof with best fire clay flue lining.

All exposed brick to be face brick as selected by owner. The putty mortar used and material for same to be furnished by mason contractor, using the best fresh burned local lime and sharp sand. The shades of mortar and width and style of mortar joint used to be selected by owner.

(19) Lath and Plastering—Lath all side walls and ceilings thruout with dry white pine No. 1 lath, joints broken every 18 inches and lath at least ⅜ inch apart on ceilings and but little closer on side walls. There must not be any lathing thru angles, from one room to another; should the lathers find any corner not properly secured, they must not lath until it is made permanent by the carpenter, and in all cases lath to go to floor and behind wainscoting.

Over this apply the plaster, which is to be two-coat work, the first a coat of good brown hair mortar, the last coat to be a plaster of paris hard finish. Cement wainscoting in kitchen, bathroom and lavatory 4 feet 6 inches high. Bathroom wainscotings to be blocked to imitate tile with bead joint.

(20) Exterior Lath and Plastering—Where so marked on drawings, the exterior wall surfaces (above sheathing and paper) are to be stripped with No. 1 pine ⅞ by 1¾-inch furring, spaced 16 inches on centers (over each studding).

Cover this entire surface with heavy expanded metal lath, securely fastened to all furring strips with heavy galvanized iron staples. Lath must be well fitted and painted with mineral paint, or galvanized.

Cover this lath surface with two coats cement plaster, first coat to be a scratch coat gauged with fresh lime and cattle hair of best proportions to insure the best and most workmanlike job, troweled on with sufficient force to form good clinchers around lath, and all surfaces must be straight and true. When this coat is dry cover the same with a second coat, composed of one part Portland cement to three parts sand, well mixed, adding enough water to work well and finish the surface with "Rough Cast," "Pebbled" or smooth, as may be preferred.

(21) Carpenter Work—The carpenter shall furnish all the necessary materials and labor, tools and every species of hardware, including nails, bolts, spikes, screws, etc., and he shall supply all minor articles of carpentry and woodwork, including all necessary jobbing and cutting for all other trades that are required for the perfect and efficient completion of the various works. Put up necessary temporary doors and board up windows in first story and cellar; cover for doors and board up windows first story and cellar; cover for protection the treads of all stairs, also all other interior and exterior work liable to damage during the construction of the said building.

(22) Timbers—All rough lumber, where no particular timber is specified, shall be of good spruce, sound, well seasoned, free from large, loose or dead knots or other imperfections liable to impair the durability or otherwise weaken the timber.

All floor joists must be sized to widths and set crowning-edge upward. All joist, studding, rafters and other framing timbers to be set 16 inches on centers, unless where otherwise mentioned on drawings.

(23) Headers and Trimmers—Frame double-headers and trimmer joist, well spiked together, around all stairways, chimney breasts, etc.

All joist under partitions to be set double. Bearing partitions to be cross-bridged.

All door and window studs shall be set double; truss over all openings in bearing partitions in a substantial manner; angles of rooms must be made solid.

(24) Bridging—All joist to be well cross-bridged with good sound 2 by 2-inch stuff, well fitted at the angles and put in as soon as joists are leveled.

(25) Sheathing—Enclose the entire exterior vertical frame wall surface of building with surfaced No. 2 common matched sheathing boards, laid close, well nailed with two eightpenny nails to all studding; all loose knots cut out and all sheathing well fitted around windows, doors, angles and corners.

(26) Building Paper—Cover the entire exterior sheathed surface with a good heavy tar building paper, all joints well lapped at least 6 inches and run in under all casings, around windows and doors and to lap around all angles and corners. Also cover all rough floor surface with one thickness of building paper after all plastering is completed and dry.

(27) Siding—The building is to be sided with first quality clear poplar or white pine siding, 4 inches wide and laid with a lap of at least 1 inch. Cut close joints against all casings, corner boards, etc., and properly nail with sixpenny nails every 16 inches. The carpenter is to notify the painter to prime all siding as soon as it is placed in position.

(28) Roof Sheathing and Shingles—Cover the entire surface of main roof and all porch roofs with No. 2 common sheathing boards ⅞-inch thick by 6 inches wide and spaced 2 inches apart, well nailed to all rafters and tightly fitted at all dormers, etc.

The entire roof to be shingled with the best 16-inch white cedar shingles, laid 4½ inches to the weather. Make perfectly water-tight around all chimneys, etc. All shingles to be nailed with at least two galvanized cut shingle nails to each shingle. The carpenter must see that all sheet metal flashing is properly set in place while shingling, as he will be held responsible for all leaks in the roof after all shingling is completed.

(29) Exterior Trimming—All exterior finishing lumber to be of good white or cypress where exposed to view or weather, well fitted in place and primed by painter as soon as work is completed.

(30) Porches—Construct porches as shown on elevations and details. Rear porch floor to be of 1 by 3-inch dressed and matched select white pine flooring, with all joints painted with a thick coat of white lead and oil while it is being laid.

Porch ceiling to be of ⅞-inch clear, narrow beaded yellow pine ceiling, and same material to be used for cornice planciers.

(31) Outside Steps—All outside and porch steps must rest on masonry piers run from below frost to grade line by the mason as directed by the carpenter is not shown on foundation plan.

Rear outside steps to have 2 by 10-inch carriages 1⅜ by 11½-inch treads made from three 3½-inch pieces, laid ½ inch apart, ⅞-inch risers, ⅞-inch cove under all nosings. Ends of steps to be finished as shown on elevations.

(32) Rough Floors—Cover the entire floor surface thruout, with surfaced and matched No. 2 common fencing, well

nailed to all joist and tightly fitted in all corners, and all flooring damaged by plumbers, gas-fitters, furnace men or other mechanics must be replaced by the carpenter in first-class condition before it is covered with the building paper and finished floor.

(33) Top Floors—After all plastering and cement work is completed and dry and all plumbing and gas pipes have been installed, cover the entire rough floor surface with paper, as before specified, and then lay the finish floor as follows:

The parlor, dining room, first floor hall, and second floor hall are to have clear, kiln-dried ⅞ by 2¼-inch plain sawed red oak flooring.

The kitchen, pantry, lavatory and three chambers are to have clear, kiln-dried ⅞ by 2¼-inch face white maple flooring.

All closets to have surfaced No. 2 fence flooring; all bad knots and other defects cut out.

All oak floors to be hand-smoothed, scraped and sand papered, then to be filled by painter and given one coat of shellac varnish, then covered with paper or canvas for protection until all carpenter work is completed.

(34) Door Frames—All outside door frames to be 1¾ inches thick, to be rabbeted ½ inch by thickness of doors, to have 1¾-inch thick oak sills.

All inside door jambs to be ⅞ inch thick by thickness of partitions, of same wood as trim of wood in which it faces and fitted with ½ by 1¾-inch stops.

(35) Doors—All outside doors to be 1¾ inches thick with glass above lock rail. The exterior surface of all outside doors to be of white pine. The interior of all outside doors to be of same wood as hereafter mentioned for inside doors.

All inside doors facing hardwood trim to be veneered with same wood as hereafter specified under head of "Inside Trim;" to be 1⅜ inches thick and to have three-ply, glued-up horizontal panels.

All doors must be kiln-dried, sandpapered, free from knots, checks, plane marks, stains, finger marks and perfectly hung in place and in working order.

(36) Window Frames—All single sash frames to be regular plank frames 1¾ inches, rabbeted ½ inch by thickness of sash, of select white pine or cypress.

All frames for check rail windows to be of the form, styles and dimensions as marked on plans; all pulley stiles to be ⅞ inch thick, of hard pine.

(37) Sash—All sash to be of clear white pine 1⅜ inches thick. All single sash are to be hung on good butts and to swing as desired by owner, where not otherwise mentioned.

All check-rail sash to be hung on cast iron weights with sash cord and secured with good sash lock.

(38) Fly Screens—Contractor to provide all windows, outside doors and enclose rear porch with fly screens, well fitted in place, constructed out of white pine for frames, with best enameled wire cloth. All check rail windows to have half screens to slide up. All single sash windows to have hinged screens. Front door screen of red oak. All doors to have spring hinges.

(39) Inside Finish—All finish to be clear, sand-papered clean and smooth. Closets to be trimmed with plain 4-inch O. G. casing (no blocks). See details for all other trim.

All windows to have proper stools and aprons. Outside doors to be fitted with oak thresholds.

Put in place beam ceilings (if desired), wainscot, columns, seats, book cases, etc., where same are shown on plans, all according to details.

All inside finish to be as follows:

Oak—All of first floor, stairway, and second floor hall.

Birch—All of second floor except hall.

(40) Closets—All closets to be finished up with at least two shelves as directed by the owner and to have ⅞ by 3-inch hook strip fastened to walls and to extend around entire closet with hooks fastened to same every 6 inches.

(41) Angle Beads—Furnish turned angle beads 4 feet long; put in place on all plastered angles. Also put up all necessary door strikers against the base where the doors would otherwise strike the walls.

(42) Pantry—Construct and set in place all pantry shelving, cupboards, drawer-cases, bins, etc., as shown on plans and as directed by the owner, all to be complete in every respect and ready for use.

(43) China Closet—To be constructed of same wood and design of trim as balance of dining-room woodwork, having three adjustable shelves and glass above a 1⅛-inch counter shelf which is to project with a moulded edge to form a cap for the case of six drawers below; all this work must be done in a most mechanical manner and in harmony with the other trim.

(44) Stairways—Construct the front stairway as shown on plans out of kind of wood mentioned above for hall, all treads and risers to be housed, wedged and glued into wall string.

Cellar stairs to have 1⅛-inch tread, ⅞-inch risers and ⅞-inch wall strings of yellow pine with cove under nosing.

(45) Hardware—The contractor must furnish and put in place all necessary hardware, such as hinges, locks, bolts, etc., also knobs, butts, locks, latches, trimmings and fastenings of every description of the styles, weights and finishes as selected by the owner.

(46) Sheet Metal Work—Gutters to be made of No. 26 galvanized iron, well fastened to roof and to have proper fall. Place all down spouts of No. 26 galvanized iron where shown on elevation or where may be found necessary.

All flashings are to be made with No. 26 galvanized iron, all to be well painted on both sides before putting in place.

(47) Outside Painting—Paint all of the sheet metal work and exterior woodwork, except roof, three coats of pure white lead, mixed with boiled linseed oil, tinted to suit the owner. Coat all large and dark knots with a thick coat of shellac varnish. Prime all frames as soon as delivered, and all other woodwork as soon as set in place by carpenter. After priming coat is dry, putty up all nail holes and other imperfections with best linseed oil putty.

All shingles to be dipped in shingle stain and given one brush coat after laying. All this work must be done by experienced men and satisfactory to owner.

(48) Inside Painting and Finishing—Painter must see that all woodwork is in proper condition to receive the first coats before proceeding with the work. All inside woodwork to be filled as soon as delivered to building, and all oak floors filled as soon as laid and properly smoothed by carpenters.

All oak or other hardwood trim woodwork, doors and floors to be filled with a paste filler, tinted to suit owner.

Over this apply to all woodwork, except floors, one coat of a standard surfacer and one coat of "Dead-Lac," or similar preparation.

Finish all oak floors and treads of stairways with two coats of an approved floor finish, well flowered to an even surface. Finish all maple floors in kitchen, bathroom and pantry with two coats of boiled linseed oil.

(49) Glazing—Glaze all sash, outside doors and transoms with best American double strength "AA" quality sheet glass, well sprigged and puttied.

(50) Drainage—Excavate for trenches, etc., leaving the undisturbed bottom for all drainage shown on foundation plan, or herein described; giving pipe a uniform fall from highest point of soft tile (being 12 inches below cellar floor) to its connection with city sewer.

(51) Boiler—Put in one galvanized hot-water boiler to contain 30 gallons on cast iron standard. Make all necessary connections for water-back to stove and to basement furnace. Hot water to be taken from the boiler to the sink, bath tub, wash bowl and laundry tubs. Boiler to have a ½-inch sediment cock at bottom.

(52) Sink—Place one white enameled 18 by 30-inch cast iron roll-rim sink where shown on floor plans, trapped with "S" trap and screw and to have brass ⅝-inch bibbs (for cold water, hose bibb) and enamel drain and 12-inch enameled back.

(53) Bath Tub—Put in one 3-inch roll-rim enameled iron bath tub, with overflow and strainer, rubber plug and chain complete; supplied with nickel-plated combination bath-cock and trapped with lead drum trap.

(54) Water-Closets—Put in place in bath room and in lavatory two syphon jet water-closets, with low-down antique oak tank, with pull complete and antique oak double cover, making the whole a complete job in all respects.

(55) Wash Bowls—Put in place in bath room and in lavatory two enameled iron top and back and apron. Basins to be supplied with nickel-plated chains, stay, plug and strainer, trapped with lead "S" trap and screw and supplied with nickel-plated basin cocks and nickel-plated bracket and screws.

(56) Laundry Tub—Furnish and set in place in basement, complete, a two-compartment slate or soapstone laundry tub, 16 inches deep, 24 inches wide by 4 feet long, set on painted cast iron legs. To have 1½-inch brass waste plugs, lead trapped waste, and supplied with hot and cold water thru "Fuller's" ⅝-inch brass hose bibbs.

(57) Furnace—Furnish and install warm air furnace, with heating pipes running to all rooms; fresh air duct from inlet in north basement wall and thence under basement floor in vitrified clay pipe to furnace; also re-circulating pipe from hall; all as shown on drawings; work to be done in best workmanlike manner; the job when complete to be guaranteed to heat the building to 70 degrees in zero weather.

(58) Gas fitting—The building is to be piped for gas, with outlets in kitchen and in bath room.

(59) Electric Wiring—All the electrical work herein included shall be executed according to the rules and regulations adopted by the National Board of Fire Underwriters and subject to the inspection and approval of the local Board of Fire Underwriters.

The building shall be thoroly equipped from the source of supply to each outlet with best insulated copper wire and approved brand and acceptable to inspector, well installed. Fixtures to be supplied by owner.

Comment on Specifications.

The foregoing is a typical specification and is more complete than the usual run. The following notes will explain some points that may not be clear; to facilitate reference the different paragraphs of the specifications have been numbered:

1—The important clause here is "the complete and substantial execution of everything described, shown or reasonably implied"—the word "complete" cannot be twisted—you cannot leave out the connecting up of the chandeliers (58 and 59) even tho it is not mentioned, if they were not connected up they would not be complete. The plumbing waste pipes and water pipes are not shown on the plans nor are they mentioned in the specifications, nevertheless they are "reasonably implied," so in they go. Cellar floors and porch floors are of cement not specified—but shown on plans, it means that they are to be constructed in the ordinary way.

4—Facilities to examine shall be given the architect. Sometimes when some defective work is put in it is covered over so as to escape detection; this clause gives to the owner or architect the right to uncover, tear out plastering, etc., to see if the construction has been properly done. The repairs to be made at the expense of the contractor.

5—An important paragraph, the building must be constructed to keep out wind and water, sometimes flashing are too skimpy and the wind forces in the rain or snow and causes a leak—it is up to the contractor to make good. Liability for accidents is also placed directly on the shoulders of the contractor; in the contract, however, it is usually mentioned that the owner is to have the building insured against fire during its construction. The hazard of storm, the stealing of wood, etc., is borne by the contractor.

17—The waterproofing method to be agreed upon by the owner; this means that if the owner insists on a certain waterproofing he has no kick if it is not satisfactory. If the contractor puts it in without consulting the owner he assumes the responsibility—if the waterproofing is omitted the owner has the right to insist on it going in or to be allowed for it. Don't say "it is not necessary." If something is specified and going to be paid for it should go in.

19—No centerpieces, coves or mouldings are specified, hence all corners are to be squared. In blocking out plaster work to imitate tile, ask the owner what size is wanted.

20—Stucco work should be done over a waterproof paper only, but in this case it is mentioned later. Find out, by showing samples, the kind of stucco finish the owner wants. Don't slap anything in.

21—A specific framing timber is mentioned, now it may be that spruce is hard to get but you can easily get yellow pine; tell the owner or architect about it first however.

23—Nothing is mentioned about bridle irons or joist hangers, but put them on if they are necessary, rather than trust to spiking on a long header. The words, "substantial execution" (1) covers this.

25—Nothing is said about whether the sheathing is to run straight or diagonally.

27—Sometimes it is up to the carpenter to do the priming. It is usually so on stucco or shingle jobs where only the trim is to be painted.

28—In regard to the flashing, it does not clearly say who is to do it or who is to supply it, but under **Sheet Metal Work** (46) the flashing is described and if this work is sublet it is up to the sheet metal worker to do all the flashing. The carpenter must "see" that it is done before he goes on with the siding, etc.

33—As nothing is said about the laying of the flooring, it is to be laid plain, without any border effect, etc.

35—Specifications do not state whether 2 or 3 butts are to be used on the door, neither is it mentioned under hardware (45). The safe plan is to follow the customary practice of 2 butts on the inside doors and 3 on outside doors, and see that the frames are well blocked out. The style of doors "2 panel," "5 panel," etc., is not mentioned nor style of doors between dining room and sun parlor.

39—One point here is about the beam ceilings; no design is given with the plan and almost anything would answer the term "beam ceiling," while the owner might have in mind an elaborate series of cross beams as his idea of it. It is loose things like this in specifications that cause trouble. To avoid it find out what style of beam ceiling is to be provided and how it is to be arranged before you start the work. The picture moulding is to go in any and all rooms if desired by the owner. It is shown on the plans but the specifications do not indicate the rooms in which the moulding is to be installed.

42—From the plans a cupboard and work table are desired but no further information is given. It is best to clear up this point before you figure on the job for, "As directed by the owner," is a bad clause for the builder who may think just a plain affair will do.

43—The construction of the china closet or buffet is a little better described, still a detail of the elevation would help out.

44—No detail is given of stairs. One does not know whether an open or closed outer string is desired, or the kind of newell and balusters, or if the wall space below the outer string is to be plastered or paneled, etc. More real particulars are given of the cellar stairs. In a case like this one is "stuck,"

but if the reader remembers clause 4, it states clearly that the architect will furnish further details on request, which should be done also for the pantry, china, closet, beam ceilings, etc.

45—The owner might select a front door lock set costing $3, or one costing $9, and the same is true of the inside of the house. It would be best to make an allowance of say $30 for the hardware, and then, if it runs more, the owner is to pay the difference as an extra. If this is not done, put on what is customary for houses of this sort, as the clause, "reasonably implied" (1), would cover the case.

47—There may be doubt regarding who is to dip the shingles. Usually it is the carpenter, but as no mention was made in the carpenter's section it is up to the painter to do it.

48—Nothing is mentioned about finishing the walls, whether they are to be tinted or papered or left plain. An owner insisting that it should be papered with paper costing 50 cents a roll would be entirely within his rights under the word "complete" (1). Bath rooms are usually finished in white and nothing is mentioned about this, and the outside of the tub usually needs paint and enamel to make it look right. Get these things settled before proceeding.

52 to 56—The plumbing fixtures are a frequent cause for dissatisfaction unless they are selected by the owner. It is far better to make an allowance for the fixtures and fittings or have the owner supply them. From the specifications the sink may be in three separate prices or all in one—it is not stated. No size is mentioned for the wash bowls—anything would do and the owner could do nothing, but the successful contractor wants to please his customers—to give them what they want and make them pay for it. If you take these matters up in the first place and explain that this size costs so much more than the smaller, etc., there will be no room for dissatisfaction later on.

59—The electric fixtures are to be supplied by the owner, but it is up to the contractor to connect them properly.

CHAPTER XXIII.

QUESTIONS FOR THE OWNER TO SUPPLEMENT PLANS AND SPECIFICATIONS

After you have gone over the plans and specifications there are a number of points on which you should obtain the owner's wishes to give him good service. No matter how well a house may be built, if the owner's pet schemes and ideas are disregarded it means dissatisfaction. Remember that a family usually builds but once and they do not know all the points. Ask them some of the following questions to find out their wishes.

After you have done a good job it is rather disconcerting to stand with the lady of the new house and hear her say, "Oh, I am disappointed. I wanted a cove ceiling in my bedroom," etc. Things that could just as easily have been done if the builder but knew it.

To the list of questions here given you probably can add others derived from your experience or warranted by local conditions and customs:

Do you wish a frame house covered with shingles, clapboards, stucco or brick veneer or a house of stone, brick, concrete block, solid concrete or hollow tile covered with cement stucco; or any combination of these materials? Tastes vary; some prefer the first story of stone, brick, etc., with second story, clapboards, stucco, etc.

If there is any stucco work what kind of a finish do you prefer—rough, smooth, etc.; and what color—white, cream, grey, etc.?

If stone or brick house state how you wish window openings—arched or lintels; also if stone or concrete window sills are to be used.

If house is to be of stone, state kinds—cobble, dressed field stone, quarried stone, etc.

If you wish clapboards, are narrow or wide ones desired, and how do you wish the corners? With corner boards or mitred?

If shingled, is there any particular way you wish the shingles arranged?

Do you desire the foundation to be of solid concrete, concrete block, hollow tile, stone, brick or only piers or posts?

Do you prefer a roof of shingles, slate, asbestos shingles, tin, tar and gravel, composition, or tile?

Do you wish wood, cement or tile for porch floors?

Do you wish any outside or inside blinds? Storm sash? Storm shutters? Screens on windows and doors? Are porches to be screened?

Do you wish any terrace or pergola?

How high do you wish a first floor level to be above street grade?

Is there any special piece of furniture for which you wish a place provided? If so give dimensions.

Do you wish a vestibule? If so, state if tile floor, wainscot, etc.

What size front door do you desire?

Do you wish any side lights?

What style of doors do you wish? Five panel, six panel, etc.; also any particular sized doors?

Any sliding doors?

Any glass doors or French doors?

Do you wish swing doors between kitchen and dining room?

What height windows do you wish? Any special width?

Do you wish any casement windows? If so what ones?

Any windows to be of stained glass, frosted glass, etc.?

What style stairway do you prefer?

Any special design of newel, balusters or rail that you prefer?

What kind of trim do you wish around door and window frames; plain or with moulding?

What kind of a wood finish do you wish in the different rooms?

The living room, hall, dining room, kitchen, bath room, bedrooms?

What kind of a wood flooring do you wish in living room, hall, dining room, kitchen, bedrooms, attic?

Do you wish beam ceilings, if so in what rooms and how arranged?

Do you wish a built-in buffet and china closet in dining room?

Do you want a special place for ice box with outside door for receiving ice?

Do you wish a cement or tile floor in bath room?

Do you wish a cement hearth in kitchen?

Do you wish a cement or tile wainscot in bath room or just the plain walls?

Do you wish any wainscot in kitchen, either cement, wood or tile?

Do you wish a chair rail in any room?

Are cellar partitions and ceiling to be plastered?

Have you any preference regarding lathing or plastering?

Any coves between walls and ceiling desired? If so, how deep?

Any ornamental panels on walls or mouldings around walls or ceilings or any center pieces desired?

Do you wish a coal chute?

Do you want a cistern to receive rain water from the roof?

Do you want gas or electric lights, or both?

Do you wish wall lights or ceiling lights?

Do you wish any floor or wall plugs for attachments?

Do you wish tin, galvanized iron or copper flashings?

Do you prefer round or square rain water leaders of copper or galvanized iron?

What colors do you wish on the outside of the house? The body, trim, room?

Have you in mind any special interior painting or decorative scheme that you wish carried out?

Do you wish a cement walk or other path around house?

Do you wish any fences, corner posts, any terraces, arbors or pergolas in ground?

Do you wish any outbuildings—garage, poultry house, barn, etc.?

CHAPTER XXIV.

NOTES AND COMMENTS ABOUT SPECIFICATIONS

A specification is a series of directions of what material to use and how the construction is to be made, also a description of things to be done that are not shown on the plans. It is usually self-explanatory, but there are some points that are not clear, and we give below a few of these. In ordinary practice the specifications and the plans are made part of the contract.

The worst bone of contention is a specification that does not say what or how the building is to be constructed and that accompany plans that have few if any details but having a clause in the specifications stating "The material to be selected by, and the work erected in the best manner as will be directed by the architect." It is the architect's business to know what will suit and how it should be erected and he should specify it. When a loose specification is given it is hard indeed to know exactly what is wanted or will do.

That Word "Complete."

"It is contemplated by these specifications and drawings to entirely complete the building, and anything necessary thereto must be done." This clause puts the responsibility of making the building complete directly upon the contractor and is a bad one for him; it is usually the subterfuge of the incompetent architect to cover his carelessness or lack of knowledge. A case in point is where a cellar floor is not marked "cemented" on the plan and no reference made to it in the specification, but still it would be necessary to go in to "complete" the house and the contractor would have to stand the loss if he should overlook it.

The fixtures or other supplies furnished by the owner sometimes give rise to a question of what is expected of the contractor. He may think that if the plumbing fixtures are supplied by the owner he will also include the fittings. See that every item is specified that the owner is to supply and figure on everything that is not and you will be on the safe side. It is far better to lose a job than to lose on a job.

The little word "all" is very important in the specifications for a house. In a hollow tile house the specification called for "all the walls and ceilings to be lathed and plastered." The contractor understood that he could plaster directly on the inside of the blocks forming the outer walls, but he had to fur and lath all of them.

Removal of Refuse.

If nothing is said about the removal of refuse and dirt from excavations this is up to the owner to pay for. This is true only in cases where the owner has his own architect. Where the contractor supplies the plan and specification it is his place to finish the job by cleaning up, whether he has so specified it or not.

Fitting Up the Closets.

The fitting up of closets is a common cause of dissatisfaction. So many people "thought it was going to be this way." If there are no particular notes on plans and specifications, ask. If it says, "plain, one shelf," that ends it. Sometimes the trim on the inside of a closet is entirely overlooked by the architect; at other times he states that "it shall be the same as the rest of the house." We have seen quartered oak trim on the inside of a closet.

Standard Cesspool.

Cesspools are usually mentioned in the specifications as 6′ diameter and 8′ deep, now this means six foot inside diameter. Do not try to excuse your blunder by saying that the architect did not state whether it was inside or outside. You may get caught at it and it will cost money to rectify the blunder.

Other Bones of Contention.

Dry wells are frequently not specified fully, but still they must go in complete with 4″ drain tile from the leaders and placed at a reasonable distance from the house. Usually they are made from a barrel with the heads knocked out and buried about two feet below the finished grade and filled with loose stones.

The thickness of plastering is frequently not mentioned. It should be about ¾ inches thick, and this should be figured on. In some jobs, where skimping is the rule, it is put on only ¼ inch, and in some sections even less than this, just barely enough to cover the lath.

Unless specifically mentioned, flashing is frequently a subject for argument. Look over the specifications and find out if the carpenter or the mason is to do this work and also who is to supply the material. If nothing is said regarding this inquire and get things settled first. This method will avoid arguments wherever the work is to be sublet to different contractors.

Note—For the information and guidance of retail lumbermen, contractors and building mechanics each phase or branch of a building enterprise is treated in the special chapter devoted thereto. This information was compiled by men of practical knowledge and should prove of great value to any one in any manner interested in the construction of a building.

While addressed especially to the contractor or building mechanic, the suggestions made are essentially sound and trustworthy and should be of almost equal value to the owner and the dealer in building materials. A thoro and definite knowledge of what a building is to be and how it is to be constructed is necessary to your complete success. Frequent reference to this text book will solve many a knotty problem for you.

CHAPTER XXV.

FIGURING THE AMOUNT OF EXCAVATION

Excavating is usually figured by the cubic yard and a reference to the rules in the chapter on mensuration will give anyone the necessary data to figure it out if the hole is to be merely the exact size of the foundation. In practical building operations, however, we must figure a little more than this. Footings are wider than the walls and all kinds of earth will not stay up in a perpendicular line, sand especially will slide a good deal, and to get the excavation of the proper size for the foundation and footings a good deal more must be removed. After the walls are finished it must be put back again, or "back filled," as it is called.

If the soil is of a light or unstable nature, and the specifications require that all foundations shall be carried down to what is called "hard-pan," or a solid layer of earth, without regard to depths given on the plans furnished by the designer, care should be taken in determining the depth at which this hard-pan lies. Test pits may be dug at different parts of the building site, or borings made, and the soil carefully examined as it is drawn out.

Determining Character of Soil.

A large auger fitted to a long iron or steel shank will serve as a boring tool. In wet ground, a section of pipe should be driven first and the auger used in the pipe.

If the soil is firm and no further excavation is needed than that necessary to obtain the required depth of cellar or basement below grade, the number of cubic yards of earth to be removed may be found in the following manner:

Allow at least six inches additional excavation on all sides of the outside wall line. This permits inspection of the outside of the wall as the work progresses, and allows room for any exterior work necessary on the wall.

Then, allowing this 6-inch space all around, multiply the length of the excavation in feet by the breadth in feet, and this product by the distance in feet from grade to bottom of cellar or basement floor. To this number, add the volume of the trenches dug below the bottom of the cellar floor, which are to receive the footings, and divide the result by 27, the number of cubic feet in a cubic yard. The desult will be the number of cubic yards of material to be removed, the cost of such removal varying per cubic yard with the amount to be removed, the distance to which it is taken, the quality of the soil, manner of handling, number of difficulties encountered, such as springs, ledges, etc., proper drainage in marshy land, bracing walls of neighboring buildings, season of year, and other local details which may differ in each particular case.

Trenches and Footings.

If the trenches needed for the footings are of any considerable depth, they should be figured separately, since the excavated material cannot be thrown easily from a trench over 6 feet in depth, but must be deposited on an intermediate platform and shoveled again from there and thrown out. As will readily be seen, this process involves extra cost.

Again, if there is any considerable amount of trench work to be done in connection with laying drains or pipes, this work will cost more per cubic yard than work on large areas. This is on account of the confined condition of the work in trenches as compared with the free working space of a larger area.

If ledges are encountered and blasting is necessary, the cost of excavating will be materially increased. Removal of water either from springs or marshy land will also require an extra amount to be added to the cost of handling the excavated material.

Items of Extra Cost.

Bracing of foundations of neighboring buildings, or the use of sheet piling to prevent the caving of earth walls after the excavation is under way, will also add to the general expense.

Frozen earth is harder to work than the same material at more favorable seasons of the year, and prices per cubic yard which show a profit in the summer might cause a decided loss in freezing temperatures.

Each one of the above-mentioned points should be noted, together with any other local conditions, such as removal of rubbish, trees, etc., and careful consideration given same in making up the list of operations, the cost of which is to make up the estimated cost of the excavation.

The number of cubic yards of back-filling, or earth which is to be filled in around walls or cavities, should be carefully figured by determining the volume of the space to be filled, in a manner similar to that stated for finding the volume to be excavated.

If the surface of the building site is not level, or contains irregularities of any considerable size, the method illustrated in Fig. 163 may be employed for finding the volume to be excavated above the level of the bottom of the cellar floor.

Lay out the wall lines, and allow the 6 inches all around each side. Then divide the length and breadth into a number of equal parts each, as shown in Fig. 163, the number of these divisions depending on the irregularity of the ground. The

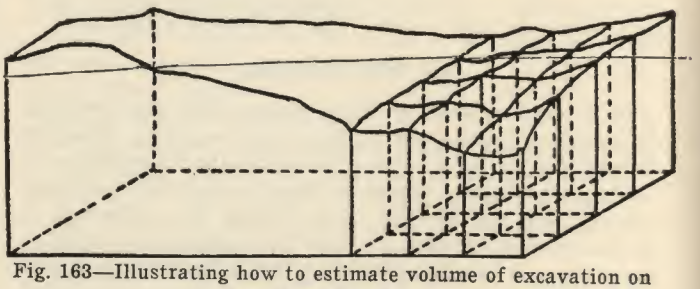


Fig. 163—Illustrating how to estimate volume of excavation on an irregular site.

volume of the material to be excavated may then be found by summing up the volumes of each of these small parts shown in Fig. 163, remembering that the volume of each small part is equal to the area of the top in square feet, found by multiplying together the lengths of the division lines in feet on two sides which meet at a corner, and then multiplying this area by what is considered to be the average height in feet of this small part above the excavated level.

The following table may be used to advantage in calculating the amount of excavation in a given case per foot of depth. The value given in the table for a given length and width is to be multiplied by the depth in feet, in order to obtain the number of cubic yards in a given job. For instance, a cellar 25 feet by 30 feet top area, and 7 feet deep, would contain from the table 27.7x7, or 193.9 cubic yards of excavation.

Slope of Earthwork.

It is often of value to know just where supports are necessary in excavation, in order that the earth forming the sidewalls of the excavation may not fall in and increase the cost of the work.

The following are values commonly given for the natural slope of different kinds of earth, the term "natural slope" meaning the angle which the earth or material may be ex-

Number of Cubic Yards of Excavation per Foot of Depth in Spaces of Various Size

Length in Feet	WIDTH IN FEET																										
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
5	.37	.55	.74	.92	1.1	1.3	1.5	1.7	1.8	2.0	2.2	2.4	2.6	2.8	2.9	3.2	3.3	3.5	3.7	3.9	4.1	4.3	4.4	4.6	4.8	5.0	5.2	5.4	5.5
6	.44	.67	.89	1.1	1.3	1.5	1.8	2.0	2.2	2.5	2.7	2.9	3.1	3.3	3.5	3.8	4.0	4.2	4.4	4.7	4.9	5.1	5.3	5.5	5.8	6.0	6.2	6.4	6.7
7	.52	.78	1.04	1.3	1.6	1.8	2.1	2.3	2.6	2.8	3.1	3.4	3.6	3.9	4.1	4.4	4.6	4.9	5.2	5.4	5.7	6.0	6.2	6.5	6.7	7.0	7.2	7.5	7.8
8	.59	.89	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.5	3.8	4.1	4.4	4.7	5.0	5.3	5.6	5.9	6.2	6.5	6.8	7.1	7.4	7.7	8.0	8.3	8.6	8.9
9	.67	1.0	1.3	1.7	2.0	2.3	2.7	3.0	3.3	3.7	4.0	4.3	4.7	5.0	5.3	5.7	6.0	6.3	6.7	7.0	7.3	7.7	8.0	8.3	8.7	9.0	9.3	9.7	10.0
10	.74	1.1	1.5	1.8	2.2	2.6	3.0	3.3	3.6	4.0	4.4	4.8	5.2	5.6	5.9	6.3	6.7	7.0	7.4	7.8	8.1	8.5	8.9	9.2	9.6	10.0	10.4	10.7	11.1
11	.82	1.2	1.6	2.0	2.4	2.8	3.3	3.7	4.1	4.5	4.9	5.3	5.7	6.1	6.5	6.9	7.3	7.7	8.1	8.5	9.0	9.4	9.8	10.2	10.6	11.0	11.4	11.8	12.2
12	.89	1.3	1.8	2.2	2.7	3.1	3.5	4.0	4.4	4.9	5.3	5.8	6.2	6.7	7.1	7.6	8.0	8.4	8.9	9.3	9.7	10.2	10.6	11.0	11.5	12.0	12.4	12.8	13.3
13	.97	1.4	1.9	2.4	2.9	3.4	3.9	4.3	4.8	5.3	5.8	6.2	6.7	7.2	7.7	8.2	8.7	9.1	9.6	10.1	10.6	11.0	11.6	12.0	12.5	13.0	13.5	14.0	14.4
14	1.04	1.6	2.1	2.6	3.1	3.6	4.1	4.7	5.2	5.7	6.2	6.7	7.2	7.8	8.3	8.8	9.3	9.8	10.4	10.9	11.4	11.9	12.4	13.0	13.4	14.0	14.5	15.0	15.5
15	1.1	1.7	2.2	2.8	3.3	3.9	4.4	5.0	5.5	6.1	6.6	7.2	7.8	8.3	8.9	9.4	10.0	10.6	11.2	11.7	12.2	12.8	13.3	13.9	14.4	15.0	15.6	16.1	16.6
16	1.2	1.8	2.4	3.0	3.6	4.2	4.7	5.3	5.9	6.5	7.1	7.7	8.3	8.9	9.5	10.0	10.6	11.2	11.8	12.4	13.0	13.6	14.2	14.8	15.4	16.0	16.6	17.2	17.8
17	1.3	1.9	2.5	3.1	3.8	4.4	5.0	5.7	6.3	6.9	7.5	8.2	8.8	9.4	10.0	10.7	11.3	11.9	12.6	13.2	13.8	14.4	15.1	15.7	16.4	17.0	17.6	18.2	18.9
18	1.3	2.0	2.7	3.3	4.0	4.7	5.3	6.0	6.7	7.3	8.0	8.6	9.3	10.0	10.6	11.3	12.0	12.6	13.3	14.0	14.6	15.3	16.0	16.6	17.3	18.0	18.6	19.3	20.0
19	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3	7.0	7.7	8.4	9.1	9.8	10.6	11.2	12.0	12.7	13.4	14.0	14.8	15.5	16.2	16.9	17.8	18.3	19.0	19.7	20.4	21.1
20	1.5	2.2	3.0	3.7	4.4	5.2	5.9	6.7	7.4	8.1	8.9	9.6	10.4	11.2	11.8	12.6	13.3	14.0	14.8	15.5	16.3	17.0	17.7	18.5	19.2	20.0	20.7	21.4	22.2
21	1.6	2.3	3.1	3.9	4.7	5.4	6.2	7.0	7.8	8.5	9.3	10.2	10.9	11.6	12.4	13.2	14.0	14.8	15.5	16.3	17.1	17.8	18.6	19.4	20.2	21.0	21.7	22.5	23.3
22	1.6	2.4	3.3	4.0	4.9	5.7	6.5	7.3	8.1	9.0	9.8	10.6	11.4	12.2	13.0	13.8	14.6	15.5	16.3	17.1	17.9	18.7	19.5	20.4	21.2	22.0	22.8	23.6	24.4
23	1.7	2.6	3.4	4.3	5.1	6.0	6.8	7.7	8.5	9.4	10.2	11.0	11.9	12.8	13.6	14.4	15.3	16.2	17.0	17.8	18.7	19.5	20.4	21.3	22.1	23.0	23.8	24.6	25.5
24	1.8	2.7	3.6	4.5	5.3	6.2	7.1	8.0	8.9	9.8	10.6	11.5	12.4	13.3	14.2	15.1	16.0	16.9	17.8	18.6	19.5	20.4	21.3	22.2	23.1	24.0	24.9	25.7	26.6
25	1.8	2.8	3.7	4.6	5.5	6.5	7.4	8.3	9.2	10.2	11.1	12.0	12.9	13.8	14.8	15.7	16.6	17.6	18.5	19.4	20.4	21.3	22.2	23.1	24.0	25.0	25.9	26.8	27.7
26	1.9	2.9	3.9	4.8	5.8	6.7	7.7	8.7	9.6	10.6	11.6	12.5	13.5	14.4	15.4	16.4	17.3	18.2	19.2	20.2	21.1	22.1	23.0	24.0	25.0	25.9	26.9	27.8	28.8
27	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0	22.0	23.0	24.0	25.0	26.0	27.0	28.0	29.0	30.0
28	2.1	3.1	4.1	5.2	6.2	7.2	8.3	9.3	10.4	11.4	12.4	13.4	14.5	15.5	16.6	17.6	18.6	19.7	20.7	21.7	22.7	23.7	24.8	25.9	26.9	28.0	29.0	30.0	31.0
29	2.1	3.2	4.3	5.4	6.5	7.5	8.6	9.6	10.7	11.8	12.8	13.9	15.0	16.1	17.2	18.2	19.3	20.4	21.4	22.5	23.6	24.6	25.7	26.8	27.9	29.0	30.0	31.1	32.1
30	2.2	3.3	4.4	5.5	6.7	7.8	8.9	10.0	11.1	12.2	13.3	14.4	15.5	16.6	17.8	18.9	20.0	21.1	22.2	23.3	24.4	25.5	26.6	27.7	28.8	30.0	31.1	32.2	33.3

pected to make with a horizontal line before particles of the earth or excavated material will begin to slide into the trench.

	Degrees.
Loose peat	14
Wet clay	16
Moist sand	22
Vegetable earth	28
Dry sand	38
Shingle	39
Gravel	40
Firm peat	45
Rubble	45
Well-drained clay	45
Compact earth	50
Chalk	55

In case it is desired to know the height of perpendicular wall of earthwork (as in ditches) which will support itself for a short time without bracing, the following may be used as a guide:

Dry sand or gravel	1 ft. to 2 ft.
Ordinary earth	2 ft. to 3 ft.
Drained loam	5 ft. to 8 ft.
Clay	9 ft. to 12 ft.

In leaving earthwork in form of an embankment, it is not advisable to try to approach its natural slope when grading,

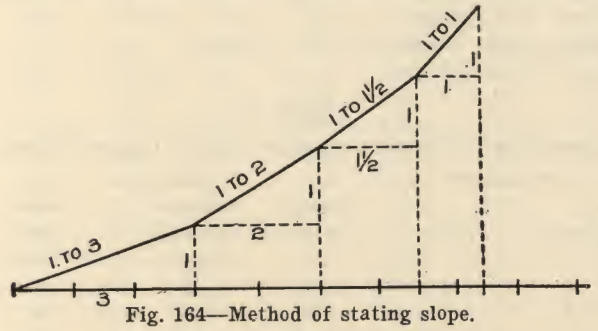


Fig. 164—Method of stating slope.

but leave the lower part with a more gentle slope than the upper part. In clay, a slope of 1 to 1½ at the top of an embankment is often flattened to a 1 to 3 slope at the bottom, especially if the embankment is of considerable height. This same principle of changing slope applies to other materials as well.

The meaning of the term "slope of 1 to 3" as used, is that there is an increase of one foot of height in the sloping side of the embankment for each three feet of horizontal distance, or distance along the level ground, as shown in Fig. 164.

The following will give a basis upon which to compare natural slopes of excavated materials in degrees with the commonly expressed "1 to 1," "1 to 3," etc., used in practice:

Slope of 1 to ½ equals angle of 63½ degrees with horizontal.
Slope of 1 to ¾ equals angle of 53 degrees with horizontal.
Slope of 1 to 1 equals angle of 45 degrees with horizontal.
Slope of 1 to 1¼ equals angle of 38⅔ degrees with horizontal.
Slope of 1 to 1½ equals angle of 33⅔ degrees with horizontal.
Slope of 1 to 1¾ equals angle of 29¾ degrees with horizontal.
Slope of 1 to 2 equals angle of 26¾ degrees with horizontal.
Slope of 1 to 3 equals angle of 18½ degrees with horizontal.
Slope of 1 to 4 equals angle of 14 1/5 degrees with horizontal.

Rock Excavation.

Rock excavation is commonly measured in place before loosening, and is paid for by the cubic yard of actual excavation. In sewer work and in tunnel work, no extra payment is made for excavation beyond certain definite boundary lines shown on the excavation plans, unless special arrangements have been made for payment in such cases. Care should be taken to note whether the contractor or owner is to pay for extra work caused by accidental slides of rock due to blasting.

In case of rock which is to be used for filling purposes in soft ground or near water, the contractor should remember that a liberal allowance should be made for rock which will disappear in the mud or be rolled away by the current. Where work of this kind is to be paid for by the cubic yard of material in place, there is a chance for loss.

If rock is to be excavated and measured by the cord, the method of piling the loose material will govern the measurement to a considerable extent. Where slabs are corded up carefully by hand, the pile will average about 30 per cent voids or holes. The meaning of the term "cord" should also be clearly defined, since a cord of wood is 128 cubic feet, but a cord of stone may mean 32 cubic feet.

Likewise, the term "perch" is a very indefinite quantity, as explained later in the chapter on masonry work.

CHAPTER XXVI.

FIGURING MASONRY WORK

There are no universally adopted rules for measuring stone masonry, and the custom in each locality must be ascertained before bidding upon or measuring up work of this kind. The most satisfactory manner of measuring stone is by the **cubic yard.** To find the number of cubic yards contained in a wall or pile of stone, measure the length, height, and thickness of the wall or pile, obtaining all three **dimensions in feet and fractions of a foot.** Multiply these three quantities together, and divide the product by 27, the number of cubic feet contained in 1 cubic yard. Suppose, for example, the measurements to be: Length, 92 feet; height, 13 feet 6 inches (13½ feet); thickness, 16 inches (1⅓ feet). Then we have: $92 \times 13\frac{1}{2} \times 1\frac{1}{3} \div 27 = 61\frac{1}{3}$ cubic yards.

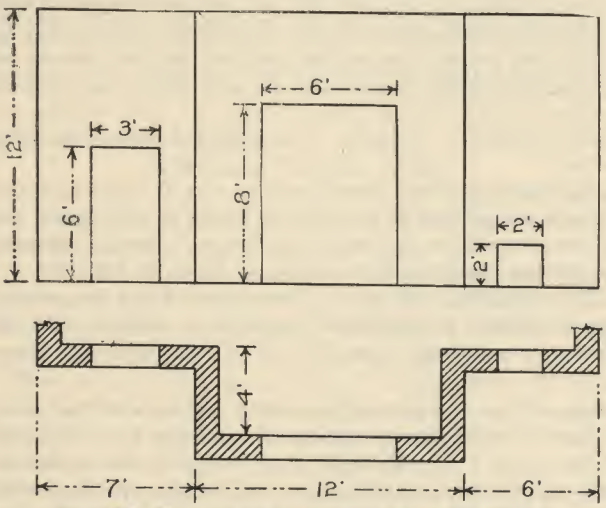


Fig. 165—Measuring masonry in a small buildin~.

Measurement.

The **cord,** or 128 cubic feet, is sometimes used, but has no advantage over the cubic yard as a unit of measurement.

The **perch,** which is also used as a measure of stone or stonework, is often misleading, on account of the varying value of a perch in different localities. This value may range all the way from 16½ to 25 cubic feet, depending upon the custom in the particular locality.

It is easier to build a straight, plain wall than one containing corners or curves; and for this reason the number of cubic feet in a wall is not an exact index of the worth of such work. One way of allowing for such extra work is to count the openings for windows and doors as solid, thus adding to the actual number of cubic feet in the wall. Another rule sometimes adopted is to take out the openings, and add 1 cubic foot for each linear foot of corners to be finished, including the vertical sides of windows and doors.

For example, let Fig. 165 represent the plan and elevation of the front of a small building to be measured. According to the first rule, the volume is:

$(8 + 25) \times 12 \times 1\frac{1}{2} = 594$ cubic feet.

By the second rule, it is:

$594 - (4 + 18 + 48) \times 1\frac{1}{2} + 12 \times 6 + 32 = 593$ cubic feet.

If the extras for the corners be counted 18 inches thick, the result will be 52 cubic feet more, or 645 cubic feet.

If the corners are in foundations under ground, they are usually left so rough that no allowance is made for building them.

Usually openings not wider than twice the thickness of the wall are measured as solid; and some allowance is agreed upon as extra to be added for building corners, curves, or other unusual work.

It is seen from the above example, that as much as ten per cent of the total volume may depend upon the method adopted in the measurement. Accordingly, care should be taken that all parties concerned are, from the first, acquainted with the practice to be adopted.

Mortar for Masonry.

Table A indicates the amount of cement mortar required for laying one cubic yard of masonry of various kinds.

The manner of using Tables A and B is shown in the following problem: How many barrels of Portland cement and cubic yards of sand will be required for laying 100 cubic yards of rubble masonry in 1:3 cement mortar?

From Table A it is seen that the minimum amount of mortar needed per cubic yard of masonry is .33 cubic yard. In Table B it is seen that 1 cubic yard of 1:3 cement mortar requires 2 barrels of cement and .9 cubic yard of sand. Therefore, .33 cubic yard of mortar would require about ⅔ of a barrel of cement and .3 cubic yard of sand. Multiplying these quantities by 100, since there are 100 cubic yards of masonry to be laid, the result is 67 barrels of cement and 33 cubic yards of sand.

Amount of Water.

Allow 50 to 60 gallons of water per cubic yard of stonework.

TABLE A.

Amount of Mortar Required for a Cubic Yard of Masonry.

Kind of Masonry	Mortar, Cubic Yard	
	Minimum	Maximum
Ashlar, 12 in. courses, ¼ in. joints	.06	.08
Ashlar, 18 in. courses, ¼ in. joints	.03	.04
Ashlar, 12 to 20 in. courses, ⅜ to ½ in. joints	.07	.08
Ashlar, 20 to 32 in. courses, ¼ to ⅜ in. joints	.05	.06
Brickwork (bricks of standard size, 8¼x 4x2¼ in.) ⅛ in. joints	.10	.15
¼ to ⅜ in. joints	.25	.35
½ to ⅝ in. joints	.35	.40
Concrete, clean stone, without gravel or screenings	.50	.55
Rubble, coarse, not dressed	.33	.40
Rubble, roughly dressed	.25	.30
Squared-stone masonry, 12 in. courses and ¾ in. joints	.20	.25
Squared-stone masonry, 18 in. courses and ¾ in. joints	.12	.15

TABLE B.

Quantities of Materials per Cubic Yard of Cement Mortar.

Proportions		Materials		
Cement	Sand	Barrels Portland	Cement (Packed) Western	Sand, Cubic Yard
1	0	7.1	6.4	.0
1	1	4.2	3.7	.6
1	2	2.8	2.6	.8
1	3	2.0	1.8	.9
1	4	1.7	1.5	95
1	5	1.3	1.1	.97
1	6	1.2	1.0	.98

CHAPTER XXVII.

FIGURING BRICKWORK

It is customary to estimate brickwork by the thousand brick contained in the wall. As many parts are not open to inspection, it is clearly not possible to determine the number by actual count, and recourse must be had to measurement.

The methods of measuring brickwork in walls and in construction work vary with different contractors and in different parts of the country. Many use a rough rule of measuring around the walls, multiplying this measurement by the height, and then multiplying by the number of bricks contained in a square foot of wall of the thickness to be used. They make no allowance for windows, doors, or openings of any kind, of an area less than about 80 square feet, since they claim that the labor necessary around such openings will offset the saving in the bricks that are not used.

As a means of compensating for this seemingly large estimate on the amount of brickwork, some contractors do not allow extras for arches, pilasters, etc.

If deductions are made for openings larger than 80 square feet, contractors using the above method generally measure the width as 2 feet less than the actual width. A rule among some contractors is to figure all walls as solid, and then make an allowance for mortar.

Another method in common use—and one which seems to be a little more rational and sonservative, while not claiming to be exact—is to measure the actual wall surface, deducting all openings over 2 feet square, measuring the corners only once for brick walls, and then multiplying by 7½ for a 4-inch wall; by 15 for an 8 or 9-inch wall; by 22½ for a 12 or 13-inch wall; by 30 for a 16 or 18-inch wall; by 38 for a 20-inch wall; and by 45 for a 24-inch wall. The results of such a procedure will give the approximate number of "eastern" brick in the wall. Deduct about 1/5 the number if "western" brick are used. Table A may be used to advantage in figuring by this method.

TABLE A.

Number of Common Bricks Required for Walls of Different Thicknesses.

Surface Area of Wall (Square Feet)	Number of Bricks Needed for Thickness of 4 Inches	8 Inches	12 Inches	16 Inches	20 Inches	24 Inches
1	7	15	23	30	38	45
2	15	30	45	60	75	90
3	23	45	68	90	113	135
4	30	60	90	120	150	180
5	38	75	113	150	188	225
6	45	90	135	180	225	270
7	53	105	158	210	263	315
8	60	120	180	240	300	360
9	68	135	203	270	338	405
10	75	150	225	300	375	450
20	150	300	450	600	750	900
30	225	450	675	900	1,125	1,350
40	300	600	900	1,200	1,500	1,800
50	375	750	1,125	1,500	1,875	2,250
60	450	900	1,350	1,800	2,250	2,700
70	525	1,050	1,575	2,100	2,625	3,150
80	600	1,200	1,800	2,400	3,000	3,600
90	675	1,350	2,025	2,700	3,375	4,050
100	750	1,500	2,250	3,000	3,750	4,500
200	1,500	3,000	4,500	6,000	7,500	9,000
300	2,250	4,500	6,750	9,000	11,250	13,500
400	3,000	6,000	9,000	12,000	15,000	18,000
500	3,750	7,500	11,250	15,000	18,750	22,500
600	4,500	9,000	13,500	18,000	22,500	27,000
700	5,250	10,500	15,750	21,000	26,250	31,500
800	6,000	12,000	18,000	24,000	30,000	36,000
900	6,750	13,500	20,250	27,000	33,750	40,500
1,000	7,500	15,000	22,500	30,000	37,500	45,000

Wall Measure and Kiln Count.

In the Western States the terms **wall measure** and **kiln** count are often heard. "Wall measure" is simply a common trade rule and is not exact. Amounts of brickwork are calculated by the arbitrary rule of 22½ brick per square foot of wall surface for a 12-inch wall just referred to and as shown in Table A. This method is often insisted upon by workmen as the basis for computing labor in laying brickwork. Contractors often use this method of estimating number of bricks in figuring cost of brickwork, and then do not figure for cost of mortar; allowing the extra number of bricks figured over the number actually needed for the wall, to take the place of the cost of the mortar and possibly a part of the labor. If bricks were ordered by this rule, there would be a greater number than needed for the work.

"Kiln count" means the actual number of bricks needed for the work, or the number to be purchased. If kiln count is used, mortar will have to be figured separately, as no allowance is made. The size of brick should always be specified in figuring. For standard bricks, 8¼x4x2¼ inch, 17 is the number usually estimated as occupying 1 square foot of 12-inch wall when joints are thick, that is, between ⅜ and ½-inch, or 18 when ¼-inch joints are used.

The Cubic Volume Method.

Sometimes the actual wall contents are measured in cubic yards of volume, and the following plan used. For common brick 8¼x4x2¼ inches in size, allow 500 bricks to a cubic yard of wall when ⅜-inch mortar joints are used. In work where thin joints are used—as, for example, in fronts, where a ⅛-inch joint may be used—it is better to figure on about 580 bricks for a cubic yard of wall.

Another rule is to divide the total number of superficial feet of wall surface of a given thickness by 160, and multiply the result by the number of brick widths the wall is thick. The result will be the number of thousand of brick contained.

This rule is based on the fact that a 4-inch wall contains about 1,000 brick to 160 superficial feet, if the joints be ¼-inch thick.

For example, a 12-inch wall 40 feet long and 20 feet high would contain $(40 \times 20 \div 160) \times 3 = 15$ thousand bricks.

While the above rule gives the number of brick to be purchased for the wall, another arbitrary rule for the payment of the masons is sometimes adopted:

Count 7½ bricks for each superficial foot of wall for each half-brick (half-length of brick) thickness of wall.

In the same example as above, this would give $40 \times 20 \times 7½ \times 3 = 18$ thousand bricks as a basis of payment for the labor.

The allowance for openings is not a uniform practice, but may be fairly well established by custom in any given city. These customs must be consulted in letting or computing such work.

Hollow walls are generally figured as solid.

Figuring Arches.

Arches are figured from the spring; and pillars or columns may be figured as a wall of length equal to the width and height of the pillar, and of thickness equal to the third dimension of same.

When stonework, such as sills, caps, etc., is set by the brickmason, no deduction is made for same in figuring brickwork for walls. The same conditions apply to ashlar work when placed by the bricklayers.

An allowance of 5 or 6 percent should be made on all figured amounts of brickwork to make up for loss and breakage. A common rule in fancy bricklaying is to add 50 percent to the figured number of bricks, or allow 1½ bricks for each one actually estimated.

A method of measuring footings together with walls, is to add the width of the projections of the footing on each side of the wall to the height of the wall, and figure as indicated above for an ordinary wall.

TABLE B.

Number of Bricks Required in Brick Piers.

(Standard Size of Brick, 8¼ × 4 × 2¼ Inches)

Size of Pier (Inches)	Number of Bricks per Foot of Height	Size of Pier (Inches)	Number of Bricks per Foot of Height	Size of Pier (Inches)	Number of Bricks per Foot of Height
8¼x 8½	9	22 x22	62	35 x52½	238
8¼x13	14	22 x26½	75	39½x39½	200
8¼x17½	19	22 x30½	86	39½x44	224
8¼x22	23	22 x35	100	39½x48	244
		22 x39½	112	39½x52½	268
13 x13	22			39½x57	290
13 x17½	29	26½x26½	90		
13 x22	37	26½x30½	104	44 x44	250
13 x26½	45	26½x35	120	44 x48	270
		26½x39½	134	44 x52½	296
17½x17½	40	26½x44	150	44 x57	320
17½x22	50			44 x61	345
17½x26½	60	30½x30½	120		
17½x30½	69	30½x35	138	48 x48	296
17½x35	79	30½x39½	154	48 x52½	324
		30½x44	172	48 x57	350
		30½x48	188	48 x61	376
		35 x35	158	48 x65½	400
		35 x39½	178		
		35 x44	198		
		35 x48	218		

If using western brick, size, 8½x4⅛x2½ in., deduct 1/5 from the number of brick indicated in Table B.

In figuring the number of bricks needed for piers of considerable size, and where the bulk of the mortar used in the joints will prove a considerable factor, it would be safer to figure the cubic contents of the pier in cubic feet, and divide by 27 to reduce to cubic yards. Then apply the rule already given of 500 bricks to a cubic yard.

Mortar for Brickwork

After the number of bricks which are to be laid is estimated, the amount of materials needed for mortar may be found from Table C and from the statements given below. The amount of sand, lime, or cement depends on the richness of the mortar and the thickness of the joints.

Table C gives the necessary amount of sand and cement to lay 1,000 bricks with joints about ⅜ inch thick.

Stated otherwise, a cubic yard of brick masonry with ½-inch joints requires rather more than ⅓ cubic yard of mortar. If the joints are ¼ inch thick, ¼ cubic yard of mortar will be sufficient to lay a cubic yard of brickwork. When joints are only ⅛ inch thick, ⅛ cubic yard of mortar will be required to a cubic yard of brickwork.

A barrel of lime will make 2¼ barrels (or .3 cubic yard) of lime paste. A barrel of this paste, with 3 barrels of sand, will make 3 barrels of lime mortar. A barrel of unslaked lime is sufficient for 6¾ barrels of 1:3 mortar.

TABLE C.

Mixing Table for Mortar for Laying 1,000 Bricks.

Mortar		Lime Barrels	Cement Barrels	Sand Cubic Yards
Lime	1	1	...	...
Sand	3	...	...	0.5
Portland Cement	1	...	1.5	...
Sand	3	...	...	0.5
Natural Cement	1	...	1.5	...
Sand	3	...	...	0.5
Portland Cement	1	1	...	...
Lime	1	...	1	...
Sand	3	...	...	0.5

If laid in 1:2 cement mortar with ⅜-inch joints, 1,000 brick will require about 1⅓ barrels of cement and 2⅔ barrels of sand. With ¼-inch joints, 1,000 brick will require about 1 barrel of cement and 2 barrels of sand.

If laid in 1:3 cement mortar, with ⅜-inch joints, 1,000 bricks will require about 1 1/9 barrels of cement and 3⅓ barrels of sand. With ¼-inch joints, 1,000 bricks will require about ¾ of a barrel of cement and 2¼ barrels of sand.

Colors for Lime Mortar.

Mortar colors generally are purchased in the form of dry powders. These powders are mixed first with the dry sand; then the cold slaked lime or putty is added, and the mass thoroughly mixed again. **Hot lime should not be used when mixing colors.**

When spread joints are used, 1,000 brick will require about 50 pounds of red, brown, or buff coloring, or about 45 pounds of black. If buttered joints are used, 1,000 brick will require about 40 pounds of red, brown, or buff, or about 35 pounds of black coloring material.

Where colored mortar is to be used, the amount of coloring will depend somewhat on the shade required, and it is advisable to estimate on about 50 pounds per 1,000 brick. The coloring material, sand, and lime should all be carefully measured, so as to keep the same proportions throughout the entire work.

Number of Brick in a Wall.

Table A will be of service in determining the number of common bricks 8¼x4x2¼ inches in size which are needed for walls of ordinary thickness.

For example, suppose that we wish to find from the table the number of bricks in a wall 125 feet long, 15 feet high, and 12 inches thick. This wall contains 125 × 15 = 1,875 square feet.

	No. Brick
For 1,000 square feet of 12-inch wall the table gives	22,500
For 800 square feet	18,000
For 70 square feet	1,575
For 5 square feet	113
Total, 1,875 square feet, requires total of	42,188

This same method can be applied to any size of wall, by simply breaking up the total number of square feet in the wall into parts which are given in the table, and then adding these parts for the final result. This final result is in what is called "wall measure," and not actual number of brick.

It should be noticed, in using this table, that the thicknesses of wall are given in multiples of 4 inches, or the width of one brick. By adding the thickness for mortar joints, it can be readily seen what column so-called 13-inch walls, 17½-inch walls etc., will fall under.

For actual number, or "kiln count," multiply this number by 17, and divide by 22½.

Short Method of Estimating Brick for Footings.

When "standard" size brick, 8¼x4x2¼ inches, are used in

footings with offsets of 2 inches for each course used, Table D, based upon the calculation here shown, may be used.

TABLE D.

Number of Common Bricks in Footings.

Thickness of Wall (Inches)	Number of Courses Used in Footing	Number of Bricks per Foot of Length in Footing
8	2	10½
12	3	22½
16	4	39
20	5	60
24	6	85½

Fig. 166 shows an 8-inch wall resting upon a footing consisting of 2 courses of brick laid with offsets of 2 inches. There are 3½ bricks shown when looking at the end of this footing. If we stood around on the side of the footing, we should see the ends of 3 bricks 4 inches wide for each foot length of side of footing. Multiplying the number of bricks shown in the end view, by the number shown per foot of length in the side view, we have: $3\frac{1}{2} \times 3 = 10\frac{1}{2}$ bricks per foot length of footing.

With other thicknesses of wall, thicker footings are needed; but the same plan for finding number of bricks per foot length of footing may be used.

For sizes of brick other than that on which Table D is based, the figures there given will be varied to some extent.

Bricks Required for a Chimney.

If it is desired to obtain a fairly close estimate as to the number of bricks necessary for a plain chimney, one of the methods described below may be used.

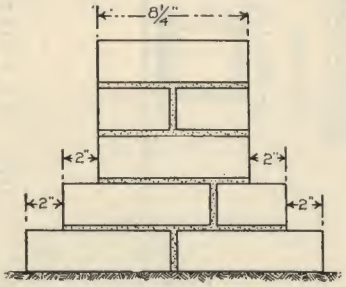


Fig. 166—Brick footing for 2-inch offsets.

If it is figured that 5 courses of brick laid in a chimney will make 1 foot of height, taking into account the thickness of the mortar joints, and that 5 bricks in a course will make a flue 4 by 8 inches, then $5 \times 5 = 25$ bricks would be necessary for 1 foot of height of a chimney with a 4 by 8-inch flue.

For a flue 8 by 8 inches, 6 bricks would be needed in each course, or 30 bricks for 1 foot of height.

For a flue 8 by 12 inches, 7 bricks would be needed in each course. or 35 bricks for 1 foot of height.

For a flue 12 by 12 inches, 8 bricks would be needed in each course, or 40 bricks for 1 foot of height.

By remembering the size of a common brick, and with the aid of a sketch of the cross-section of the flue desired, no matter whether it is a single, double, or triple-flue chimney, the above method of figuring the number of brick needed for any chimney, square or oblong in section, may be used. The method of procedure consists in finding the number of bricks necessary to enclose the area desired, and then multiplying by 5 to get the number of bricks per foot of height of chimney.

For example, suppose it is desired to find the number of bricks needed for a plain chimney 25 feet high and having 2 flues 8 by 8 inches, and 1 flue 8 by 12 inches.

Lay out a diagram like Fig. 167, and we find that 15 brick are needed for a course. Then, $15 \times 5 = 75$ brick needed per foot of height of chimney, figuring 5 courses of brickwork per foot of length. And, $75 \times 25 = 1{,}875$ brick, the approximate total number needed for the chimney.

If fancy designs are used, a special allowance must be made for the same, depending wholly upon the design desired.

A simple method of figuring for single flues is as follows:

Find the number of cubic feet in the chimney by multiplying the area (in square feet) of cross-section of the chimney considered as solid, by the height in feet; and subtract the contents of the flues as indicated in the following:

For an 8-inch flue, subtract one-half the length of the flue in feet.

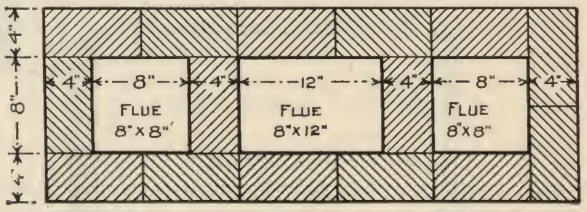


Fig. 167—Section of brick chimney with 3 flues.

For a 12-inch flue, subtract the length of the flue in feet.

For an 18-inch flue, subtract 2¼ times the length of the flue in feet.

For a 24-inch flue, subtract 4 times the length of the flue in feet.

Multiply this answer by 22½, and the result will be the number of bricks required.

Table E gives sizes and weights of common sizes of flue-linings

Fire-clay stove thimbles may be obtained in sizes varying from 4 to 12 inches in diameter, and from 4½ to 12 inches in length. These thimbles are made ¼ inch larger than measure, to receive stovepipe.

Square tile for flue linings are sized and listed commercially from outside dimensions; round tile, from inside dimensions.

TABLE E.

Approximate Weights, Dimensions, etc., of Fire-Clay Flue-Linings.

Square or Round Corners
(In two-foot lengths)

Outside Measure	Weight per Foot	Outside Measure	Weight per Foot
4½x 8½ in.	14 lbs.	8½x13 in.	28 lbs.
4½x13 in.	20 lbs.	8½x18 in.	45 lbs.
4½x18 in.	40 lbs.	13 x13 in.	38 lbs.
7½x 7½ in.	15 lbs.	13 x18 in.	57 lbs.
8½x 8½ in.	18 lbs.	18 x18 in.	75 lbs.

Round Flues
(Without Sockets)

Inside Measure	Weight per Foot	Inside Measure	Weight per Foot
6 in.	15 lbs.	20 in.	87½ lbs.
7 in.	17½ lbs.	21 in.	....
8 in.	20 lbs.	22 in.	....
9 in.	25 lbs.	24 in.	125 lbs.
10 in.	27½ lbs.	27 in.	....
12 in.	32½ lbs.	30 in.	220 lbs.
15 in.	55 lbs.	33 in.	....
18 in.	70 lbs.	36 in.	....

As a practical test we give an example of how to figure the brickwork required for a small residence as this will make clear the foreging instructions.

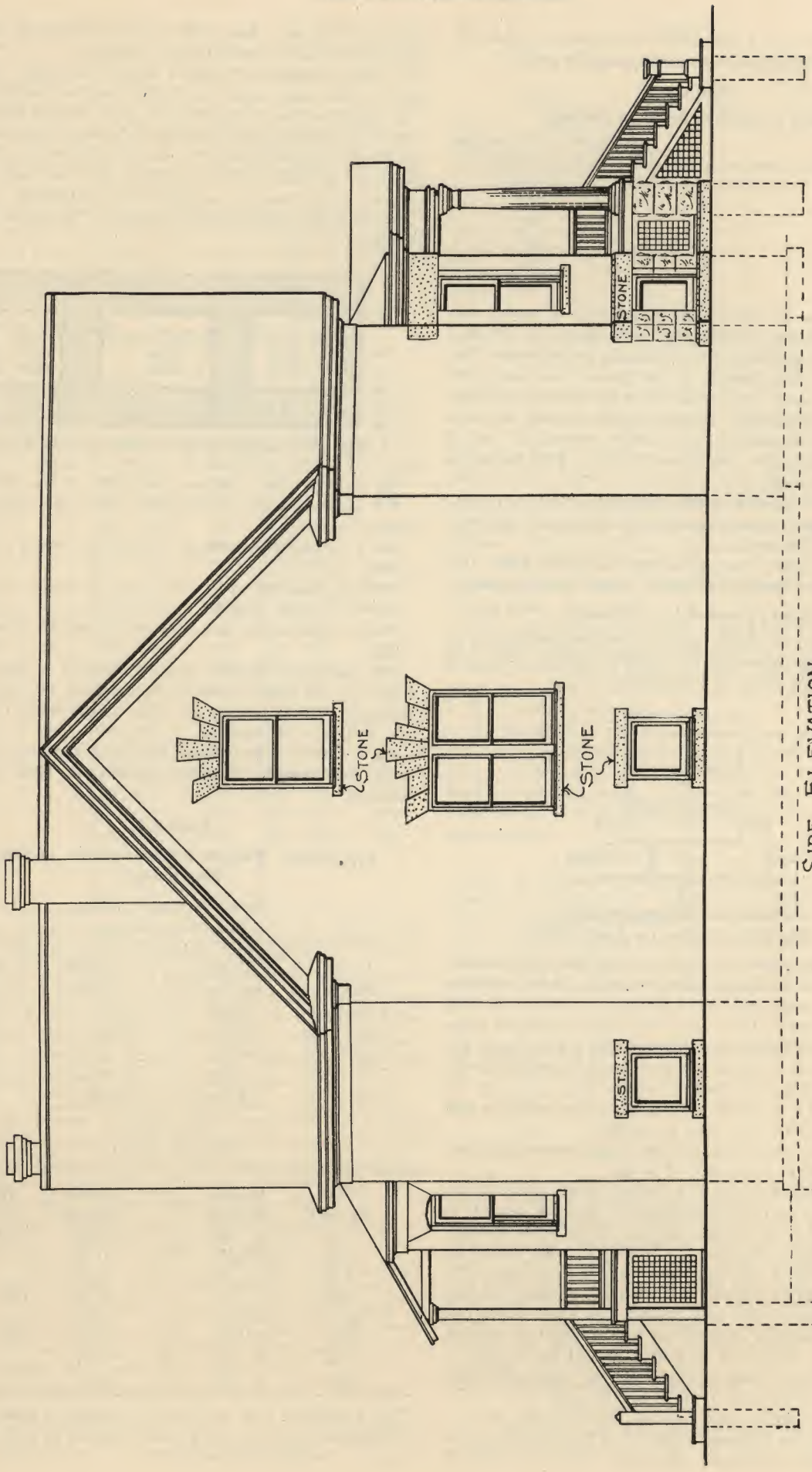


Fig. 168—Side elevation of brick house referred to on opposite page.

CHAPTER XXVIII.

FIGURING BRICK FOR A HOUSE

Figs. 168 to 173 show elevations and plans of a substantial modern brick dwelling house of 7 rooms, with bath, reception hall, and basement. We shall now endeavor to show the method of procedure to be followed in estimating the number of bricks needed for this house.

Two methods of figuring will be given first, the wall measure, or number of bricks needed on the basis spoken of on page 195, in which connection Table A is used; and second, the kiln count, or actual number of bricks bought and used, figured on a basis of 17 bricks to the cubic foot when laid in wall. If the rule of 500 to the cubic yard, spoken of on page 52 is used, a little larger number of bricks will be needed. If pressed brick is figured, with thin joints in surface work, 17 bricks to the cubic foot will be a little low. The rule of 580 to the cubic yard, or 20 to the cubic foot, will be nearer.

We shall divide the work into parts:

1. All brickwork below top of the first-floor joists;
2. Brickwork above top of first-floor joists;
3. Chimneys;
4. Deduct all openings of over 2 square feet and all stonework.

Brickwork Below Top of First-Floor Joists.

Footing.—The length around the foundation wall is about 121 feet. Thickness of footings, 8 inches, or two-thirds of a foot; width, 1 foot 10 inches, or 22 inches. Then we have:

$121 \times \frac{2}{3} = 81$ square feet of wall surface in footings.

This will be figured under the 20-inch column in Table XI, since it is 5 bricks thick, with ½ inch allowed for each of 4 joints.

From table for 20-inch wall,

80 square feet = 3,000 bricks
1 square foot = 38 bricks

For footing, 3,038 bricks

Basement Wall.

Wall is 13 inches thick, and 7½ feet high to top of first-floor joists. Length around wall is 121 feet.

$121 \times 7\frac{1}{2} = 908$ square feet of wall surface in basement.

From Table XI, for 12-inch wall,

900 square feet = 20,250 bricks
8 square feet = 180 bricks

Total for basement, 20,430 bricks

Deducting the following window space, allowing 8 inches additional width to windows and 10 inches additional depth, for size of frame opening:

		Sq. in.
1 space	36″ x 38″	= 1,368
1 space	54″ x 38″	= 2,052
2 spaces	32″ x 38″	= 2,432
1 space	44″ x 38″	= 1,672
1 space	40″ x 38″	= 1,520
Total,		9,044

Dividing this by 144, the number of square inches in a square foot:

$$\frac{9{,}044}{144} = 63 \text{ square feet of 12-inch wall.}$$

Fig. 169—Row of substantial modern brick houses, 7 rooms, in Chicago.
For elevations and plans, see Figs. 168 to 173.

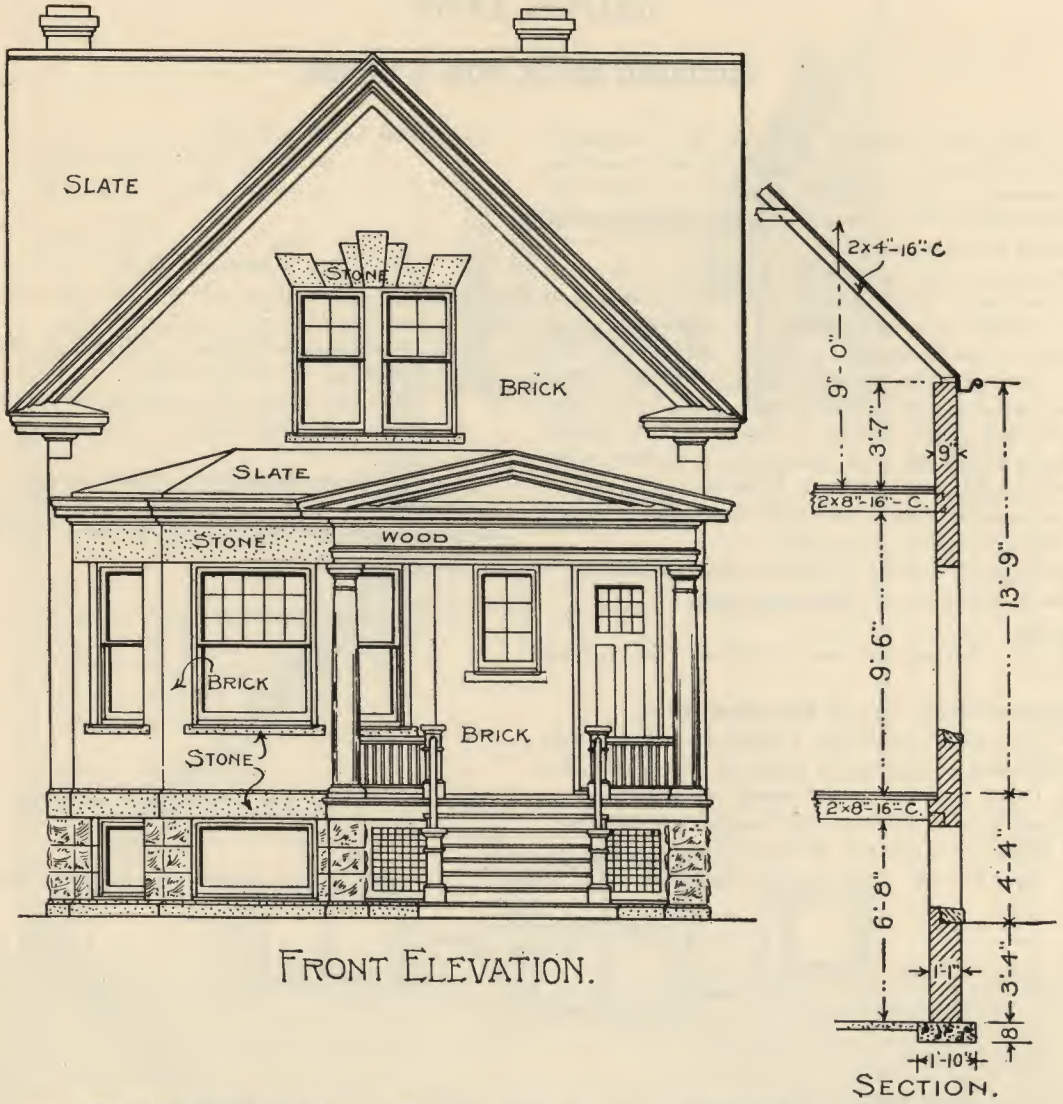


Fig. 170—Small brick house illustrating how to estimate brickwork for a residence.

This, as shown by the table, is equivalent to 1,418 bricks.

Also, deducting for basement door,

3 feet × 7 feet = 21 square feet,

and 21 square feet of wall surface of 12-inch wall, from the table, is equivalent to 473 bricks.

Total number of bricks to deduct is:

1,418 + 473 = 1,891.

Thus we have:

20,430 — 1,891 = 18,539 bricks needed in basement wall.

Area-Way Walls.

Two walls 11½ feet long by 6 feet high and 13 inches thick.

2 × 11½ × 6 = 138 square feet of wall surface.

From table for 12-inch walls,

100 square feet = 2,250 bricks
30 square feet = 675 bricks
8 square feet = 180 bricks

Total, 3,105 bricks in area-way walls.

Piers.

The following piers are called for by the plans:

2 16-inch square brick piers at front, 7 feet high.
2 16-inch square brick piers at front, 4 feet high.
2 13-inch square brick piers in cellar, 7⅓ feet high.
1 16-inch square brick pier at rear, 4 feet high.
1 8 by 12-inch brick pier at rear, 4 feet high.

Figuring these as walls either 12 or 16 inches thick as the case may be, we have:

7′ × 1⅓′ × 2 = 19 square feet of wall surface in 2 piers, 16 inches thick.

From table for 16-inch wall,

10 square feet = 300 bricks
9 square feet = 270 bricks

Total, 570 bricks

Also,

4′ × 1⅓′ + 2 = 11 square feet of wall surface in 2 piers, 16 inches thick.

From table for 16-inch wall,

10 square feet = 300 bricks
1 square foot = 30 bricks

Total, 330 bricks

Also,

7⅓′ × 1′ × 2 = 15 square feet of wall surface in 2 piers, 12 inches thick.

From table for 12-inch wall,

10 square feet = 225 bricks
5 square feet = 113 bricks

Total, 338 bricks

Also,

$4' \times 1\frac{1}{3}' = 5\frac{1}{2}$ square feet (nearly) of wall surface 16 inches thick.

From table for 16-inch wall,

5 square feet = 150 bricks
½ square foot = 15 bricks

Total, 165 bricks

For the 8 by 12 inch pier, figure it as a wall 12 inches thick, 4 feet high, and ⅔ of a foot long:

$4' \times \frac{2}{3}' = 3$ square feet (nearly) of wall surface 12 inches thick.

From table for 12 inch wall,

3 square feet = 68 bricks.

Adding together the various totals for the piers, we have:

Total number of bricks in piers = 570 + 330 + 338 + 165 + 68 = 1,471 bricks.

For total number of bricks in footings, basement walls, area-way walls, and piers, we have:

3,038 + 18,539 + 3,105 + 1,471 = 26,153 bricks.

This is wall measure, and not actual number of bricks.

If the actual number of bricks is desired, we should proceed as follows:

Find the actual cubic contents of all brickwork, and multiply the result by 17—that is, by the number of bricks contained in a cubic foot of wall with ordinary mortar joints.

The cubic contents will be figured as follows:

Footings—

$121' \times \frac{2}{3}' \times 1\frac{2}{3}' = 133$ cubic feet.

Walls—

$121' \times 7\frac{1}{2}' \times 1' = 908$ cubic feet.

Subtracting $(63 + 21) \times 1 = 84$ cubic feet for door and windows, we have:

908 — 84 = 824 cubic feet.

Area-way—

$11\frac{1}{2}' \times 6' \times 1' \times 2 = 138$ cubic feet.

Front piers—

$7' \times 1\frac{1}{3}' \times 1\frac{1}{3}' \times 2 = 25$ cubic feet.
$4' \times 1\frac{1}{3}' \times 1\frac{1}{3}' \times 2 = 14$ cubic feet.

Basement piers—

$7\frac{1}{3}' \times 1' \times 1' \times 2 = 15$ cubic feet.

16-Inch pier at rear—

$4' \times 1\frac{1}{3}' \times 1\frac{1}{3}' = 7$ cubic feet.

8x12-Inch pier at rear—

$4' \times 1' \times \frac{2}{3}' = 2\frac{2}{3}$, or 3 cubic feet.

Total cubic contents,

133 + 824 + 138 + 25 + 14 + 15 + 7 + 3 = 1,159 cubic feet.

Allowing 17 bricks to the cubic foot, we have:

1,159 × 17 = 19,703 bricks

as the actual number of bricks needed below the first floor.

If we wish to check up the wall measure, which was 26,153, by applying the rule of 22½ bricks per cubic foot of wall, we find:

1,159 × 22½ = 26,078 bricks,

which is very close to the figure found by the use of Table A, page 195.

Walls from Top of First-Floor Joists to Roof.

Since the method of procedure has now been outlined, we shall go directly to the house plans for our dimensions in each case, and proceed with less detail.

Side walls—

37 feet × 13¾ feet = 509 square feet.

From table for 8-inch wall,

500 square feet = 7,500 bricks
9 square feet = 135 bricks

Total, 7,635 bricks

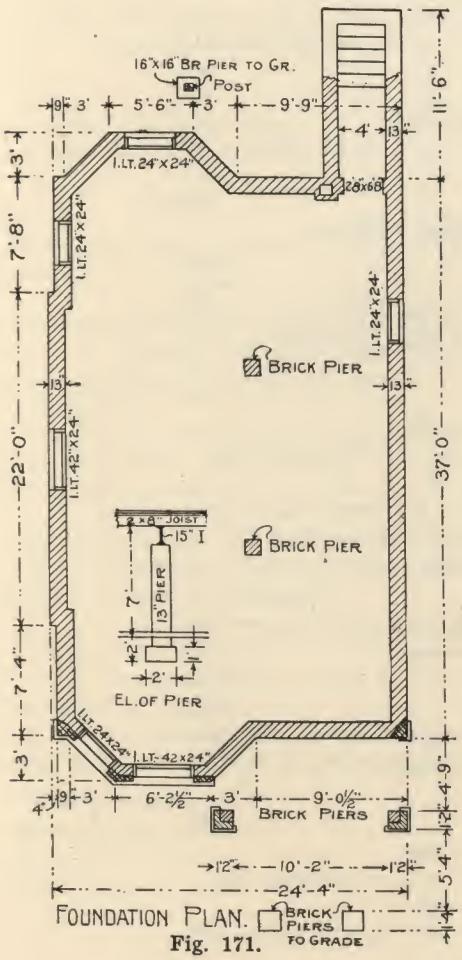


Fig. 171.

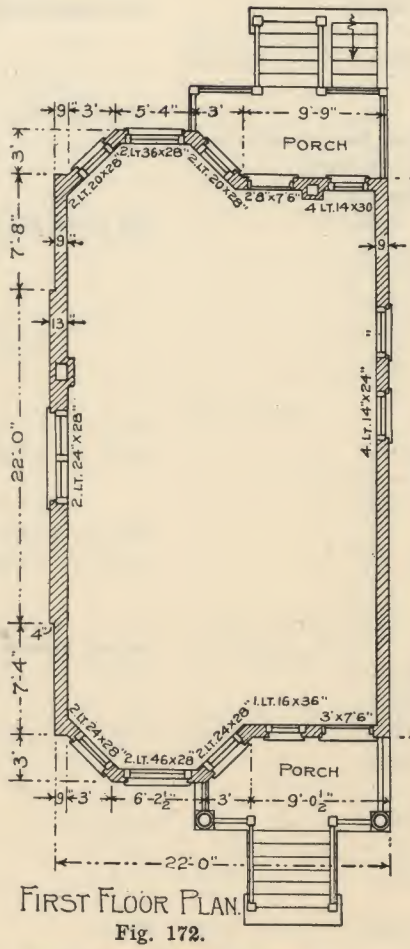


Fig. 172.

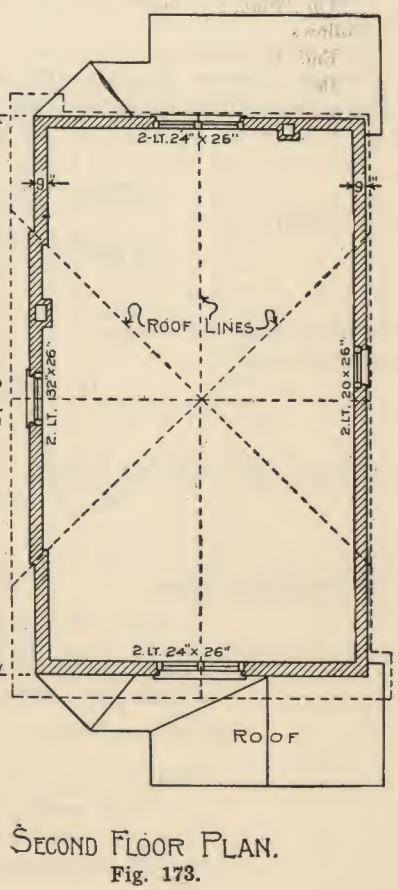


Fig. 173.

Floor Plans of Brick House.

Multiplying this by 2 for the two walls, we have:

$2 \times 7{,}635 = 15{,}270$ bricks.

Add for gables on sides

$22' \times 11' \times \frac{1}{2} = 121$ square feet.

(Area of a triangle is equal to one-half the product obtained by multiplying the length of the base by the height.)

From table for 8-inch wall,

100 square feet = 1,500 bricks
20 square feet = 300 bricks
1 square foot = 15 bricks

Total, 1,815 bricks

Multiplying this by 2 for 2 gables,

$1{,}815 \times 2 = 3{,}630$ bricks.

Then,

$15{,}270 + 3{,}630 = 18{,}900$ bricks.

Deducting opening in walls, making same allowance as before,

	Square inches
1 space $36'' \times 58''$	= 2,088
2 spaces $28'' \times 58''$	= 3,248
1 space $66'' \times 76''$	= 5,016
1 space $44'' \times 62''$	= 2,728
Total	13,080

$\frac{13{,}080}{144} = 91$ square feet of wall surface.

From table for 8-inch wall,

90 square feet = 1,350 bricks
1 square foot = 15 bricks

Total, 1,365 bricks

Deducting 1,365 from 18,900, we have:

$18{,}900 - 1{,}365 = 17{,}535$ bricks.

This is wall measure for side walls of building.

For front and rear end walls, the figuring will be done as follows:

End walls—front—

Deduct thickness of side walls, which has already been figured in in getting number of bricks in side walls.

	Square feet
$20\frac{1}{2}' \times 13\frac{3}{4}'$	= 282
with gable, $\frac{1}{2} \times 22' \times 11'$	= 121
	403
Deducting front bay window opening in wall, $12' \times 10'$	= 120
	383
Deducting also front door opening, $3\frac{1}{3}' \times 7\frac{1}{3}'$	= 25
	258

and deducting windows,

	Square inches
1 space, $24'' \times 40''$	= 960
1 space, $66'' \times 62''$	= 4,092
	5,052

$\frac{5{,}052}{144} = 35$ square feet.

$258 - 35 = 223$ square feet.

Add for bricks in front bay window:

Length around front bay = $14\frac{1}{2}$ feet
Height = 10 feet
$14\frac{1}{2}' \times 10' = 145$ square feet.

Deduct window openings,

	Square inches
1 space $54'' \times 76''$	= 4,104
2 spaces $32'' \times 76''$	= 4,864
	8,968

$\frac{8{,}968}{144} = 62$ square feet.

$145 - 62 = 83$ square feet of wall surface.

Adding 223 square feet of surface in front wall and 83 square feet in front bay, we have:

$223 + 83 = 306$ square feet.

From table for 8-inch wall,

200 square feet = 3,000 bricks
100 square feet = 1,500 bricks
6 square feet = 90 bricks

Total, 4,590 bricks

for front end wall of house.

Rear wall—

	Square feet
$20\frac{1}{2}' \times 13\frac{3}{4}'$	= 282
with gable, $\frac{1}{2} \times 22' \times 11'$	= 121
	403
Deducting rear bay window opening in wall, $11' \times 10'$	= 110
	293
Deducting also rear door, $3' \times 7\frac{1}{3}'$	= 22
	271

and deducting window openings,

	Square inches
1 space, $36'' \times 70''$	= 2,520
1 space, $38'' \times 70''$	= 2,660
	5,180

$\frac{5{,}180}{144} = 36$ square feet.

$271 - 36 = 235$ square feet of wall surface.

Add for bricks in rear bay window:

Length around rear bay = 14 feet
Height = 9 feet
$14' \times 9' = 126$ square feet.

Deduct window openings,

	Square inches
2 spaces, $28'' \times 76''$	= 4,256
1 space, $44'' \times 76''$	= 3,344
	7,600

$\frac{7{,}600}{144} = 53$ square feet.

$126 - 53 = 73$ square feet.

Adding 235 square feet of surface in rear wall, and 73 square feet of surface in rear bay, gives:

$$235 + 73 = 308 \text{ square feet.}$$

From table for 8-inch wall,

	Bricks
200 square feet =	3,000
100 square feet =	1,500
8 square feet =	120
Total,	4,620

for rear end wall of house.

Total wall measure above first floor—

	Bricks
Sides	17,535
Front	4,590
Rear	4,620
Total	26,745

To determine kiln count, or actual number of bricks, we may, as before, find the actual cubic contents of the walls above the top of the first floor joists, and then multiply by 17. Or, we may multiply the above "wall measure" number, 26,745, by 17, and divide by 22½.

$$\frac{26{,}745 \times 17}{22\frac{1}{2}} = 20{,}207 \text{ bricks, "kiln count."}$$

As a matter of interest and as a check on the work, we shall go back and add up the cubic contents of the walls above the top of the first-floor joists.

From the previous work,

	Square feet
Side walls, square feet = (509 + 121) × 2 =	1,260
Deducting openings, square feet,	91
	1,169
Front wall, square feet,	306
Rear wall, square feet,	308
Total,	1,783

Multiplying this wall surface by the thickness, 8 inches, or ⅔ foot,

$$1{,}783 \times \tfrac{2}{3}' = 1{,}189 \text{ cubic feet.}$$

Applying the rule of 17 bricks to the cubic foot, we have:

$$1{,}189 \times 17 = 20{,}213 \text{ bricks, "kiln count,"}$$

which checks with the previous result.

Chimneys—

One chimney 33½ feet high, with 8 by 12-inch flue: From page 55 we have seen that for an 8 by 12-inch flue 35 bricks are needed for each foot of height:

$$33\frac{1}{2} \times 35 = 1{,}173 \text{ bricks.}$$

One chimney 33½ feet high with 8 by 8-inch flue:

It has been shown that for an 8 by 8-inch flue 30 bricks are needed for each foot of height:

$$1{,}173 + 1{,}005 = 2{,}178 \text{ bricks.}$$

Total for 2 chimneys:

If it is desired, these figures may be checked by the chimney rule given on page 54.

Adding the numbers of bricks determined from the previous calculations, we find that the following bricks are needed:

Wall measure—

Basement and footings	26,153
Above first floor	26,745
Chimneys	2,178
	55,076

Kiln count—

Basement and footings	19,703
Above first floor	20,207
Chimneys	2,178
	42,088

A nearer approximation may be reached by deducting the volume of the cut stone shown in the plans. The walls thus far have been figured as solid brick, with no notice taken of the stone.

Cut stone—front—

Piers:

$$14'' \times 4'' \times 30'' = 1{,}680 \text{ cubic inches.}$$
$$9'' \times 4'' \times 30'' = 1{,}080 \text{ cubic inches.}$$

Front wall:

		Cubic inches
1 piece,	9″ × 4″ × 30″ =	1,080
1 piece,	6″ × 4″ × 30″ =	720
1 piece,	6″ × 4″ × 30″ =	720
1 piece	12″ × 4″ × 30″ =	1,440
1 piece	12″ × 4″ × 30″ =	1,440
1 piece	9″ × 9″ × 30″ =	2,430
1 piece,	75″ × 4″ × 12″ =	3,600
1 piece,	51″ × 4″ × 12″ =	2,448
1 piece,	51″ × 4″ × 12″ =	2,448
1 sill,	60″ × 5″ × 5″ =	1,500
2 sills,	39″ × 5″ × 5″ =	1,950
1 sill,	30″ × 5″ × 5″ =	750
1 sill,	44″ × 5″ × 10″ =	2,200
1 sill, 2d story,	72″ × 5″ × 5″ =	1,800
1 flat arch, (average height.)	72″ × 4″ × 18″ =	5,184

(Deduct stone water-table if there is one.)

Side Walls:

		Cubic inches
1 sill,	32″ × 5″ × 5″ =	800
1 sill,	42″ × 5″ × 5″ =	1,050
1 sill,	36″ × 5″ × 5″ =	900
1 sill,	66″ × 5″ × 5″ =	1,650
1 sill,	36″ × 5″ × 5″ =	900
2 sills,	28″ × 5″ × 5″ =	1,400
1 sill,	44″ × 5″ × 5″ =	1,100
1 flat arch,	72″ × 4″ × 18″ =	5,184
1 flat arch,	54″ × 4″ × 15″ =	3,240
1 lintel,	52″ × 4″ × 12″ =	2,496
1 lintel,	42″ × 4″ × 12″ =	2,016
1 lintel,	48″ × 4″ × 12″ =	2,304

Rear Wall:

		Cubic inches
1 sill,	40″ × 5″ × 10″ =	2,000
1 sill,	38″ × 5″ × 5″ =	950
1 sill,	36″ × 5″ × 5″ =	900
2 sills,	28″ × 5″ × 5″ =	1,400
1 sill,	44″ × 5″ × 5″ =	1,100
1 sill,	40″ × 5″ × 5″ =	1,000

Adding to determine the total volume of stonework, we find the result to be:

$$62{,}860 \text{ cubic inches.}$$

Dividing this by 1,728, the number of cubic inches in a cubic foot:

$$\frac{62{,}860}{1{,}728} = 36 \text{ (nearly) cubic feet.}$$

By the rule of 22½ bricks to the cubic foot, we should deduct:

$$22\frac{1}{2} \times 36 = 810$$

bricks from the "wall measure" of 55,076 bricks.

Or, by the rule of 17 bricks to the cubic foot, we should deduct:

$$17 \times 36 = 612$$

bricks from the "kiln count" or actual number used, of 42,088.

This would leave the final result as follows:

Wall measure .....54,266 bricks
Kiln count .....41,476 bricks

Allowing 5 per cent for beakage on each of the above amounts, we have:

$$54{,}266 + \frac{5}{100} \times 54{,}266 = 56{,}979 \text{ bricks}$$

$$41{,}476 + \frac{5}{100} \times 41{,}476 = 43{,}549 \text{ bricks}$$

These are the approximate numbers needed according to the two methods of figuring. In practice these numbers would probably be treated as 57,000 or 44,000.

No attempt has been made here to separate the various kinds of brick, as the intention is to show the method of obtaining the number of standard 8¼″ by 4″ by 2¼″ bricks which are needed. By applying the same methods, the number of each kind of brick in a house where several quantities are used, may be found.

On large jobs of brickwork, it is often usual for the contractor to specify a minimum size for the bricks so as to guard against losses from estimating that a certain number of bricks will build a certain number of cubic feet of wall.

Thickness of mortar joints is also a quantity to be figured on in determining actual number of brick. This point was referred to on page 194.

CHAPTER XXIX.

FIGURING CONCRETE WORK

In making up an estimate of the cost of a building, in scaling the plans, it is found convenient to take off the volume of excavation and back-filling. The cubic feet of footings, foundations, and walls, the square feet of forms for walls of foundations and above grade, the linear feet of belt-courses, moldings, cornices, etc. Also the size of special features of exterior treatment. Similarly, the superficial areas of column and floor forms are measured by themselves. Concrete of each different mixture is scaled off in cubic feet, and totaled separately. Steel of each kind is taken off in pounds. Granolithic finished surfaces in square feet; and so on in detail, every item is measured.

The dimensions of all footings for foundations may be taken directly from the plans of the structure.

For footings of rectangular cross-section, the number of cubic yards of concrete needed may be found by multiplying the length of the footing by the width, and this value by the thickness, all dimensions taken in feet; then divide this product by 27, the number of cubic feet in a cubic yard.

If the footing is stepped, the total cubic contents may be found by adding together the volume of each stepped section; or by multiplying the length of the footing by the average width, and this value by the depth, and dividing the result by 27. This same method may also be applied to footings with slanting sides, or those having a certain amount of "batter."

In case of soft soil, or where the footings are to be aided in their efforts to support the loads resting upon them by the use of concrete piles, the volume of concrete in cubic yards necessary for these piles may be obtained in the following manner: Multiply together the sectional area of the pile in square feet, the length in feet, and the number of piles of a given size, and divide the result by 27.

Concrete Foundations and Walls.

The length, thickness, and height of all foundations and walls may likewise be obtained directly from the plans. The total amount of each grade of concrete, if a different mixture is used in different parts of the work, should be figured by the method just outlined for footings, and made note of.

If walls vary in thickness at different heights in the structure, figure the contents of each belt of wall around the structure, and add together all the quantities of like mixture. Pilasters or belt courses may be figured separately, and added to the totals.

All openings such as doors, windows, etc., should be deducted from the surface of the wall in figuring, so as to get the actual cubic contents of the wall.

Any trimmings, projections, or depressions on or in the face of the wall should be considered separately, and added into the total of the mixture of which they are composed.

Measuring Concrete Construction Work.

The following rules of measurement have been adopted by the Chicago Contractors' and Masons' Association, the Chicago Architects' Business Association, and the Western Society of Engineers:

Excavation of Cellars and Basements.

1. Excavation to be measured and computed by the actual amount of material displaced. If unit price is based upon loose measurement, add 40 percent to actual bank measurement, except if consisting of sand and gravel, when only 20 percent will be added. If rehandling becomes necessary, same to be done at a special price agreed upon in addition to the above.

Excavation of Trenches and Pits.

2. Excavation of trenches, pier holes, or pits, when more than 3 feet wide, to be computed on actual contents when less than 5 feet deep.

When less than 3 feet wide, excavation of trenches, pier holes, or pits to be computed on actual contents if less than 2 feet deep.

If more than 2 feet deep, compute contents of trench on basis of 3-foot width, even though same is narrower.

If less than 2 feet in depth, estimate actual width.

For pits and pier holes more than 2 feet deep and less than 12 square feet in area, estimate area of same on basis of 12 square feet multiplied by depth of same down to 5 feet; and for more than 5 feet deep, estimate on same basis as given below for additional depth of trenches, with the same percentages of increase added:

Add 75 percent to actual contents of excavation of trenches, pier holes, or pits, for depths between 5 and 10 feet; add 150 percent for depths between 10 and 15 feet; add 225 percent for depths between 15 and 20 feet; add 300 percent for depths between 20 and 25 feet; add 375 percent for depths between 25 and 30 feet; add 450 percent for depths between 30 and 35 feet; and so on, adding 75 percent accumulative for every 5 feet additional depth.

Back-Filling and Grading.

3. Soil required for back-filling or grading to be measured by computing, from cross-sectioning, cubic contents of area to be filled or graded.

4. Sheet-piling and lagging to be estimated per thousand feet of lumber required. Kind of lumber to be specified.

5. Shoring of earth banks to be done at unit price per square foot of shored surface of bank.

6. Pumping or bailing, when required, to be done at special price, in addition to excavation unit price, as the excavation rules are based on dry work; this, however, does not apply to rain or storm water.

Concrete Foundations.

7. Foundations for walls to be measured actual contents, when made with square and level offsets.

Footings with sloping or beveled offsets less than 30 percent from the horizontal, multiply area of base by greatest height of footing. This applies to piers also, except when courses in pier foundations are less than 12 feet in area, when 1 cubic foot will be added for each corner for every foot in height of such course.

8. Foundations for all projections (such as chimney breasts, pilasters, buttresses, or flues) connected with walls, to be measured actual contents contained therein, and 1 cubic foot added thereto for each corner for every foot in height.

9. Recesses and slots in foundations to be measured solid, and, in addition thereto, allow 2 cubic feet for every foot in height or length.

10. Arches in foundations. Multiply length of chord at spring arch by height from chord to extrados by thickness of arch, and add to wall measurement. Height of arch-ring equal to thickness of wall.

11. Circular or polygon foundations to be figured at double actual contents.

12. For wall 14 feet or less in height, 24 inches or more in thickness, use the actual thickness as basis in computing volume. For walls less than 24 inches in thickness, add one-half the difference between the actual thickness and 24 inches in computing the volume. If walls are more than 14 feet in height between doors, add to cubic contents 15 percent for every additional 4 feet in height, on accumulative scale, as given for trench excavation.

13. For circular walls of radius sufficiently large to obviate the necessity of using specially prepared lumber for forms, add one-fifth of length to girth of wall, and figure cubic contents on the same basis as prescribed for external and division walls (paragraph 12).

14. For battered or sloping walls, estimate contents on same basis as for external and division walls, and add one-half of contents of wedge or batter to same when narrower on top than 24 inches. See paragraphs 12 and 17.

Intersection and division walls, 24 inches thick or less (bonded together in any manner not abutting), to be measured as slot or recess. When thicker, add 1 foot to length of wall for every intersection.

15. In retaining walls reinforced with beams, columns, or girders, figure concrete casing a minimum thickness of 12 inches from outside edge of steel on side next to earth bank, and 6 inches from outside edge of steel on opposite side; that is, compute wall, 1 foot 6 inches thicker than width of steel.

For all other retaining walls, compute on same basis as for external walls (paragraphs 12 and 17).

No deduction in cubic contents of concrete to be made for metal imbedded in same.

16. Hollow walls to be at special rates.

17. For each corner of wall more or less than 90 degrees, add 1 foot 6 inches to girth length of walls in measuring.

The term "corner' is used for salient angles of walls, and "angle' for re-entering angles.

18. All plain projections, such as chimney breasts, piers connected with walls, and pilasters, to be measured actual contents contained therein, and 1 cubic foot added for each corner for every foot in height.

19. Independent plain square piers to be measured by same rule; that is, add 1 cubic foot for each corner for every foot in height. For plain polygon or round piers, add 4 cubic feet for each foot in height.

20. Recesses and slots to be measured solid; in addition thereto, allow 2 cubic feet for every foot in height or length.

21. In vaults, multiply length of chord at spring of arch by height from chord to extrados, by thickness of arch.

In walls, find contents of arch by same rule, and add same to wall measurement as called for in paragraph 10.

In sewers and tunnel arches, multiply length of extrados by thickness of arch.

Openings with Frames Built In.

22. Deduct contents of windows, doors, and other openings, measuring from jamb to jamb and from top of sill to spring of arch, and add 2 feet of wall for each jamb for every foot in height of opening when plank frames are used; if box frames are used, add 4 feet of wall for each jamb for every foot in height.

Opening without Frames.

23. Deduct contents of openings, same to be measured from top of sill to spring of arch, and shortest distance between concrete jamb for width; and add for each jamb 2 feet of wall for every foot in height of opening.

Circular, oval, or other special-shaped openings to be figured at special price.

Chimney Breasts, Flues, and Pilasters.

24. All flues or hollows in chimneys or walls less than 2 feet in area, figure solid and add 2 cubic feet for every foot in height. All flues and hollows in chimneys or walls from 2 to 4 feet in area to be measured solid. When larger, deduct one-half contents of flue.

Detached portions of chimneys in buildings, and plain chimney tops above roof, to be measured solid, and 1 cubic foot to be added for each corner for every foot in height.

25. Detached chimney stacks to be figured at special rates.

26. No deductions allowed for omissions of concrete for cut stone, terra-cotta, or other trimmings, bond blocks, timber, joists, or lintels.

All ornamental or molded work in cornices, gutters, belt or sill courses, etc., to be figured at special rates.

27. Cutting and patching of joists, girder, or other holes, slots, panels, recesses, etc., to be paid for on basis of time and material required.

28. When ordered by owner, architect, engineer, or superintendent in charge of work, to rack or block in consequence of delay of delivery of iron, steel, stone, terra-cotta, or other material, that concrete work which may connect with such racking or blocking shall be measured as extra work, as follows: Increase girth length of such line by one-half, and multiply by thickness of wall.

Concrete Floors on Soil and Tile Arches.

29. Floors to be measured by the superficial surface between outside walls of building. No deductions to be made for floor sleeps, conduits, pipes, drain, or division or partition walls. No deduction to be made for any piers, columns, chimney breasts, pilasters, or other projections of walls, of 10 feet or less in area.

Caissons.

30. Owing to grillage in caissons being left at different heights in same building, unit price for caissons will be computed on excavated contents, including necessary wood-lagging and rings for same. Cubic contents of excavation of caissons to be computed from top of first set of lagging to bottom of caissons and from outside to outside of lagging. If steel or any other special casing is required, same to be paid for additional at special unit price per pound.

31. Area of bottom of bell to be multiplied by height of bell to neck for cubic contents.

32. For caissons 7 feet or more in diameter, estimate actual contents from outside to outside of lagging.

For caissons from 7 feet to 6 feet 6 inches, inclusive, add 5 percent to actual contents.

For caissons under 6 feet 6 inches to 6 feet, inclusive, add 15 percent to actual contents.

For caissons under 6 feet to 5 feet 6 inches, inclusive, add 25 percent to actual contents; under 5 feet 6 inches to 5 feet, add 35 per cent; under 5 feet, add 50 percent to actual contents.

33. If compressed air is required, same to be paid for in addition to the above.

34. If rings are ordered left in caissons, same to be paid for additional at unit prices per pound.

35. Pumping and bulkheading to be paid for at additional price.

36. No deduction to be made for cubic contents of metal imbedded in concrete.

Concrete for filling of caissons to be computed on actual contents per cubic foot of concrete, but no deduction to be made for any metal imbedded in same.

Reinforced Concrete Work—Reinforced Walls.

37. Compute concrete on same basis as specified in sections 12 and 17 for external and division walls, and add to same cost of reinforcing metal put in place. If, through changes or revisions, cutting of reinforcing metal delivered or ordered becomes necessary, estimate the full length of such bars or metal fabric, and add to same cost of cutting and fitting required. Reinforcing metal to be computed on unit price per pound or square foot. No deductions to be made in estimating cubic contents of concrete for any metal imbedded in same, such as wire netting, expanded metal bars, beams, columns, etc.

Columns.

38. Measuring of plain, uniform-size columns to be covered by the paragraph (19) relating to piers.

39. Capitals, cap, brackets, panels, molding, or other ornamental or molded work to be figured at special rate.

Girders, Floor-Beams, or Other Drop Projections below Floor-Slab.

40. For projections named in this paragraph, add for each corner and angle to cubic contents 1 cubic foot for each foot in length. For each chamfered or rounded corner or angle, add ½ cubic foot for each foot in length in addition to the above.

41. Floor and roof slabs to be estimated on same basis as called for in paragraph 29 for floors on soil, and at a minimum thickness of 6 inches. Less than 6 inches in thickness will be computed as 6 inches.

42. No deductions to be made in floor area for openings of less than 20 square feet. For larger openings, after deducting full area of opening, add one superficial foot to floor area for each foot in length of girth of opening, and 1 cubic foot extra for each corner or angle.

43. For pits, baskets, or other depressions in floor, add one superficial foot to the area of walls and floor of same for each foot in length of each corner and angle.

44. Setting of fascias, frames, pipes, sleeves, bolts, rods, clamps, etc., imbedded in concrete, to be paid for additional at special price.

Floor Base and Coves.

45. Floor base and coves to be estimated at special price per linear foot, with 1 foot added to length of same for each corner and angle. For base or cove around round columns, estimate three times girth of column; and for square or polygon columns, add 1 foot for each corner to girth of same.

46. Concrete stairs to be estimated per square foot area of face of treads and risers. Stair landings and platforms between floors to be same unit price per foot as stairs.

47. Curbs and roofs of skylights to be estimated on same basis as called for in sections 40 and 41, except that quantities for same shall be doubled.

48. Sidewalks laid on soil to be estimated same as floor-slab, paragraph 29 with special unit price.

Concrete Columns and Pilasters.

When columns are of the same size of cross-section from top to bottom, their cubic contents may be found in the same manner as already explained for walls and floors. Multiply the area of cross-section, in square feet, by the length in feet, and divide by 27. If all the columns of one floor are of the same length and size, the total quantity of concrete needed will, of course, be found by multiplying the volume of one column by the number of columns on that floor.

If a column is plain in design, but of variable cross-section, the volume may be found by multiplying the area of the average cross-section in square feet by the length.

If a shell of concrete is used to protect an iron column, the volume of concrete needed per column may be found by subtracting the volume of the iron column from the volume of the finished column.

When bases or caps are used, they should be figured separately, and added to the volume of the plain column. Ornamental work and bands should be treated likewise.

An approximate labor basis for column work is to allow one man one day for each one-half cubic yard of concrete placed.

The volume of pilasters may be obtained separately, figuring each size of pilaster as a column separate from the wall of which it is a part; or a part of the thickness of the pilaster may be figured in in getting the volume of the wall itself, and the projecting portion figured separately and added to the total.

Curtain walls may be figured as a vertical slab, dividing the product of the three dimensions (length, breadth, and thickness), in feet, by 27, in order to get the contents in cubic yards. The volume of all openings of any considerable size should be deducted. Projections or ornamental work should be figured separately, and added or deducted, as the case may be.

Belt-Courses, Cornices, and Exterior Ornamentation.

All work which projects from the flat surface of the wall or pilaster should be figured separately, and added to the volume already obtained. Often it is difficult to find the exact cubic contents of irregular work, but this difficulty may be largely overcome by dividing the irregular-shaped body into a number of small, regular-shaped parts, and adding the volumes of these.

If belt-courses or cornices are of a different material from that used in the walls, make a separate note of each kind of material, and consider same individually in making up the estimate.

Since, in many kinds of material, belt-courses, cornices, sills, lintels, etc., are measured and priced at a certain price per linear foot of a certain size, especially where the above are furnished as separate members to be placed in the structure during the progress of the work, it is well to take from the plans the number of linear feet of cornice, belt-courses, etc., and note each kind of material, together with the size of cross-section and number of linear feet needed.

Care should be taken when figuring monolithic work, to recognize the extra cost for form work which will necessarily accompany any deviation from the plain flat surface of the ordinary wall. Costs for such work cannot be standardized to take care of all cases; and the contractor is forced to use his judgment, basing his cost on a careful analysis of the actual materials and labor necessary in producing the change in the form, and adding this increase in cost to the original plain construction cost.

Concrete Reinforcement.

Measurements. The quantity of steel or other reinforcing material may be obtained directly from the plans of the work, and should be separated into lots of a given size and length of bar. In this way the number of pounds of steel needed may be made up easily from a table giving weights per foot of lengths for bars of different sizes. Also, any sizes which are not base may be indicated and figured as "extra."

Expanded metal or wire cloth should be figured by determining the number of square feet of the material needed, and the gauge of the metal or the wires, as the case may be. Manufacturers' catalogues contain the weight per square foot of the various sizes, and the prices for same.

If stirrups are used in beam or girder work, note whether they are fastened to the longitudinal rods or not; and, if fastened, note method of fastening.

Unit-frames should be figured by themselves, and prices may be obtained directly from the manufacturers.

Do not overlook the material needed for wiring together reinforcing rods where they cross; and be sure to allow for labor in connection with same.

Estimating Number of Concrete Blocks required.

In estimating the number of concrete blocks required for walls, the simplest method to pursue is to figure out the superficial or face area of the building. First, multiply the length around the building (in feet) by the height of the wall (also in feet); let us call this quantity A. Find the surface of gables by multiplying width of gable by its height, and dividing by 2; call this quantity B. Find the surface of each opening by multiplying its width by its height, and add together all the areas of the openings; call this quantity C. Then add together the quantities A and B, and subtract from their sum the quantity C. The result will be the net or actual face surface to be covered with the blocks (in square feet). Divide this by 100 by simply pointing off two figures at the right, and this will give the number of squares of 100 feet each to be covered.

Then turn to the following table, and multiply your number of squares by the number in the right-hand column opposite the size of block to be used. The result will be the number of blocks needed for the building.

For example, suppose the superficial area to be covered is 1,525 square feet. This will be 15.25 squares of 100 feet each. If the blocks are to be 8 by 8 by 16-inch, find this size in the left-hand column of the table, and look across to the right, where you will find the number 112. Then $112 \times 15.25 = 1{,}708$, which is the number of blocks required.

Concrete Block Data Table.

Size of Block			Solid Blocks			Hollow Blocks			
Height	Width	Length	Weight of Block (lbs.)	No. per bbl. Cement at 1:5	No. per Cu. Yd.	Weight of Block (lbs.)	No. per bbl. Cement at 1:5	No. per Cu. Yd.	No. of Blocks per Square of 100 Feet
8 x	8 x	16	73	34	48	50	49	71	112
8 x	10 x	16	92	27	38	67	37	71	112
8 x	12 x	16	109	22	32	80	31	44	112
4 x	8 x	16	35	68	99	24	100	144	224
4 x	10 x	16	44	54	79	32	70	109	224
4 x	12 x	16	53	44	66	39	63	91	224
8 x	4 x	16	37	68	95	..	..	..	112
8 x	8 x	24	112	22	31	77	32	45	75
8 x	10 x	24	140	18	25	92	25	38	75
8 x	12 x	24	166	15	21	112	21	31	75
4 x	8 x	24	54	46	65	37	66	94	150
4 x	10 x	24	67	36	52	46	52	76	150
4 x	12 x	24	79	30	44	55	44	63	150
8 x	4 x	24	55	44	63	..	..	..	75

The figures given in the above table for the weight of hollow blocks and the number produced from one barrel of cement, can, of course, be taken as only approximate, since the size of the air-space in different blocks varies. It ranges from about 27 to about 32 percent, or averages about 30 percent, of the total space occupied by the block.

Stairs and Steps.

In determining the materials needed for stairs and steps, a careful study of the plans will show that a division into simple parts is possible. For flying steps or stairs, the stringers may be figured by finding the section area and length. The volume of material needed for one step may be multiplied by the number of steps, and the total volume determined by adding the volume needed for the stringers.

In cast steps, or steps where a coarser grade of concrete is to be faced with a richer mixture, care should be taken to separate the volumes of the two grades of concrete, since there is a difference in the cost of each.

Concrete Floor Construction.

Since the thicknesses and sizes of floors are indicated on the drawings, the cubic contents of the floor-slab, the finishing coat, beams or girders for supporting floor, and all other necessary details, may be obtained directly from the plans. Generally the main body of the slab is of a different mixture of concrete from the top surface; therefore each should be taken separately from the drawings and figured.

Beams and girders may be figured by multiplying the area of cross-section of each size of beam or girder, in square feet by the number of linear feet of that particular size of beam or girder used in the structure, and dividing this result by 27. The final result will be the number of cubic yards of concrete needed for each particular size of beam or girder in the structure.

If the floors are of the slab type, such as used in the "Mushroom" or "Spider-Web" system, the contents of each floor in cubic yards may be found by simply multiplying the length of floor in feet by the width in feet, then multiplying this result by the thickness in feet, and dividing by 27.

If any material other than concrete is used—such, for example, as hollow tiles, which are employed to lighten floors in fireproof construction—the volume occupied by the material should be deducted from the total volume of the floor.

Cinder concrete, when used for fireproofing or deadening purposes, should be figured separately.

Granolithic or terrazzo work in floors should also be taken off in a separate amount, since it comes under a different rating, both in materials and in labor. In work of this kind it is common to state the number of square feet of surface to be laid, as well as the amount of material needed.

Cellar Floors.

The cost of cellar floors of concrete will depend upon the thickness of the floor-slab and the kinds of concrete used. In determining amounts of materials, the table here given will be of service:

Materials for 100 Square Feet of Concrete Floor.

	Base, 1:2½:5 Mixture Thickness, Inches						Wearing Coat, 1:2 Mixture Thickness, Inches					
	2½	3	3½	4	4½	5	½	¾	1	1¼	1½	2
Cement, Bbls.	1.10	1.30	1.50	1.78	1.99	2.21	0.56	0.85	1.13	1.41	1.69	2.26
Sand, Cu. yd.	0.40	0.47	0.55	0.63	0.70	0.78	0.16	0.24	0.32	0.40	0.47	0.64
Stone, Cu. yds.	0.80	0.94	1.10	1.26	1.40	1.56						

Sidewalks and Curbs.

Quantities of materials needed for sidewalks and curbs are determined in the same general way as already outlined. The specifications and plans according to which the work is to be performed, will give all sizes of slabs, thickness of top coat, base, and sub-base, together with the mixture to be used in each layer. From these dimensions, the number of cubic yards of each kind of concrete may be obtained; and from a table of mixtures, the amounts of materials may readily be figured.

The number of cubic yards of cinders or other material for sub-base is figured in the same manner as you would figure a thick floor-slab.

Curbs are figured by separating the volumes of coarser mixture of concrete used from the facing mixture, and determining quantities as for sidewalks.

Careful attention should be paid to plans and specifications in both of the above cases, since a difference in the quality of the mixture used in figuring, from that specified, may make quite a considerable difference in the ultimate cost.

Costs are generally given at a certain price per square foot or square yard of surface of walk; but to obtain same correctly, the exact quantities of materials used must be determined, or the exact conditions governing the construction upon which the price was based must be known. It is even

safer, then, to detail the cost in each individual case and obtain your own standards.

In getting together the quantities which go to make up the costs of sidewalk and curbing work, drainage should not be forgotten. If broken stone or tile drains are to be laid, include excavation for same, together with amounts of material needed.

Chimneys and Smokestacks.

The simplest manner of determining the volume of concrete needed in constructing a chimney or smokestack is as follows:

If chimney is of one thickness from bottom to top, find the cubic contents of the chimney figured as solid, and subtract from this result the cubic contents of the inside, or open part, of the chimney, also figured as solid. For example, if a chimney is to be built 25 feet high with 8 by 12 inch flue, walls 4 inches thick, the outside dimensions of the chimneys will be 16 by 20 inches. We shall, therefore, need from the above.

$$\frac{16}{12} \times \frac{20}{12} \times 25 = 55.6 \text{ cubic feet,}$$

less

$$\frac{8}{12} \times \frac{12}{12} \times 25 = 16.7 \text{ cubic feet,}$$

or

$$55.6 - 16.7 = 38.9 \text{ cubic feet.}$$

$$\frac{38.9}{27} = 1.44 \text{ cubic yards of concrete.}$$

If the chimney or smokestack is of different thicknesses, or of different sizes of cross-section, at various parts of its height, divide the entire height into sections (of equal thicknesses if possible), and figure each section separately, adding the various results for the total.

Ornamental work of any kind at top of chimney will have to be figured separately, and added on to give total.

Percentage of Water for Standard Sand Mortars.

Neat	One Cement Three Standard Ottawa Sand	Neat	One Cement Three Standard Ottawa Sand
15	8.0	27	10.0
16	8.2	28	10.2
17	8.3	29	10.3
18	8.5	30	10.5
19	8.7	31	10.7
20	8.8	32	10.8
21	9.0	33	11.0
22	9.2	34	11.2
23	9.3	35	11.5
24	9.5	36	11.5
25	9.7	37	11.7
26	9.8	38	11.8

The amount of water to be used may be taken as that indicated in "Percentage of Water table" which shows the percentage of water required for a 1:3 mixture. This percentage will vary, where different cements are used, according to the percentage that may be necessary for giving normal consistency to the neat cement paste.

Quantities of Materials for One Cubic Foot of Cement Mortar.

MIXTURE	Cement Barrel	Sand Cubic Yard
1 : 1½	0.15	0.03
1 : 2	0.12	0.03
1 : 2½	0.11	0.04

For example, if the neat cement requires 18 percent of water for normal consistency, then 8.5 percent of water will be needed for the 1:3 mortar mixture. The percentages of water indicated are percentages by weight, being based on the weight of the dry material.

CHAPTER XXX.

FIGURING CARPENTERS' WORK

The following directions for taking off a bill of quantities for carpenters' work is from an address given by James Young before a meeting of the Carpenter Contractors' Association, of Cleveland, and is filled with valuable data:

"The first thing I do when figuring a job, is to give a general glance over the plans, elevations and specifications. Then I turn to the basement plan and take off the number of lineal feet of girder and its size, whatever it may be, posts, if any, and these follow the date, name of architect and owner, as my first entries. Then turning to the first floor plan, I take the amount of sill in lineal feet, making an entry of that and how the sill is composed. I take that measurement accurately, by measuring the plan at its longest and widest square projection, thus, should the length be 58 feet and the width 42 feet, we have 116 feet and 84 feet, making the girth 200 feet. If there are any bays, I add 3 feet for each bay.

"We have now not only the lineal measurement for sill, but also for studding, sheathing, etc. Then I take the superficial area of the first floor for joisting, making the entry at whatever it may measure. For instance, first floor '1950, 2x10x16x19,' thus indicating the number of square feet to be joisted, the size of the joist, the spacing and the average length.

Framing.

"I then turn to the second floor and do the same, making the same kind of entry, usually with some additions; for instance, there may be some bays or projections, which are only one story high, with girders running across at these openings. I take the amount of such girders and the size of bays or projections which stop at first floor, because if they are not covered by the second story joists they must have ceiling joists. Then there may be one or more projections thrown out on the second floor which are packed with mineral wool or otherwise treated. In addition then to the mere entry of joists for the second floor, I may have entries like these: '36 feet 6 by 10 girder, 115 ceiling joists, 130 feet 4 inches wool.' The fact of the entry of wool carries with it the furring and sub-floors necessitated by its introduction. There may still remain other features on the second floor to be taken care of.

"The first floor may have a large living room over which the joists are 2 inches wider than the balance of the house and set at 12 inch on center. I take the size of that room and make an entry like this, 'extra on 24x32, 2x12, 12,' indicating that a portion of the second floor will have joist 2 by 12 set at 12 inch centers and 24 feet long.

"Having thus taken care of the second floor, I then turn to the third floor or attic and take the measurement of it. From the attic floor I take the measurement of the roof and ceiling joists or collar beams. Unless it is an absolutely plain, straight roof I never measure it off the elevations, because I think I can measure a roof that is pretty well cut up much more accurately from the roof plan, and that in one fraction

of the time required to measure each and every section or portion of roof as shown on the elevations. In the former case I know that I have got full quantity of roof, while I might be doubtful if I had by the latter method. No matter at what pitch a roof is it must bear some definite proportional relation to the amount of plan area to be covered. The only thing necessary then is to find the various proportional relations that different pitches bear per square to the plan per square to be covered. Having determined that, you decide it not only for one roof but for all time; you have then before you the simplest of propositions, and one that can be absolutely relied upon.

But this does not dismiss the matter of roof. For instance, the measurement of your attic floor for joist does not go beyond your plate line and your roof does. Then again, there may be a deck 16 feet by 20 feet. I believe it is better to make the entry '16x20 feet' than 'deck 320,' because the former entry gives not only the area of the deck, but also the amount of deck plate, and I think that it is particularly important to get a correct amount of the material that goes in a deck, because I question if the material in any other portion of a building costs as much to put in place.

"Having a deck then 16 feet by 20 feet, take 320 feet off from the measurement of your roof plan, and you have the amount on which to apply your proportional relation. I count the number of dormers in a roof and allow so much additional per dormer, determining that amount at the time according to the kind of roof the dormers may have. One-half of the roof plan will give the amount of space required for collar beams, I believe, as accurately as it may be obtained in any other way, and there can surely be no method quicker.

Cornice Work.

"I then measure the cornice. The same cornice I measure from the attic plan, as it can be measured as accurately there, and more quickly, than by taking it from four elevations. I usually make a price per foot on the cornice at that time, embracing that portion of roof which it takes to cover it. The gable cornice I measure from the elevations, also making a price per foot on it. Then I take the amount of dormer cornice. I also take the number of feet of hip for cant boards or hip shingles, as the case may be.

"I then turn to the walls. I already have the girth of the first floor. I take the girth of the second floor, and taking the mean between the two gives the girth for the total height. My entry would be thus: '200 feet of 2x5x22 stud and sheathing. I then take the final covering, whatever it may be, siding, shingles, or timber work. If siding is used I run my eye over the number of corners on the first and second floors, add them together, multiply by half the height and I have the number of feet of corner boards, or mitred corner, as the case may be. I then measure the gables and dormers. I usually put a higher price on gables and dormers than I do on the walls, because there is more waste and the work is slower.

"I then take water table belting, if any, brackets, etc. I think it is well to put a price on these at the time, because it is difficult to make a note of them in such a way as to indicate their value. At this stage I go back to the attic plan, making the entry 'attic.' If a sub-floor is used, I simply make the entry 'sub'; if it is laid straight, I follow the word 'sub' by the abbreviation 'Diag,,' if the floor is laid diagonally.

Finished Floors.

"I then measure the amount of finished floor, which is usually considerably less than the floor surface of the building, because the attic is usually studded in from the plate line. Then I take the number of feet of partition lineally; the number of feet of base; the number of doors, height, style and thickness; the number of windows to be cased ,the number of closets and how treated; the number of feet of cupboards, and whatever else appears on the first floor plan.

"I then take the second floor in much the same way, the sub-floor, the finished floor, paper-furring, wool, if any of these are called for. If bathrooms are marked 'tile,' I make an entry of so many feet of tile extra, because it costs considerably more to cut in floor between joists, fitting around pipes, than it does to lay it on top.

"In measuring partitions I always measure those running one way of the building first, then measure those running the opposite way. I think one is more apt to get a correct measurement by so doing than if he tries to measure them irrespective of the way they run.

"Then I take the number of doors, window sides, closets plain, closets with drawers, the number of feet of cupboard, the number of mantels, medicine cases, towel closets, and whatever else may appear on the second floor plan.

Hardwood Trim.

"If there is a room in hardwood, I take that by itself. If the hall is in hardwood I will have an entry 'extra on 8 veneered doors, hall'; that implies that there must be jambs with hardwood edges and hardwood finish on one side; and then so many feet of hardwood base. I usually measure the hall by itself, in any case, because not infrequently it has a wood cornice and you may not know whether it has or not until you are studying the three-quarter scale drawings.

"The first floor I treat somewhat differently. One very serious drawback to taking off quantities of interior work of the first floor is due to the fact that in many cases there is only one set of three-quarter scale interior drawings and they are kept in the office, so that it is impossible to take off the work of any one room intelligently.

"For a number of years, unless the three-quarter scale drawings accompany the plans, I have adopted the following method: After taking the partitions and floors I take each room by itself, because the style of finish may differ very materially in the different rooms. An opening in one room may be cased for three or four dollars, while that of another may be worth ten dollars or more.

"My entries for these rooms, then, are as follows: 'Living room, birch, 3 door sides, 5 window sides, 70 feet base or wainscot, 110 feet picture mould or cornice, 10 feet of alcove beam, 2 corner pilasters, mantel.' I take off each of th erooms and halls in this way, leaving two or three blank lines in my book between each room for the insertion of anything that appears on the interior drawings, but not shown on the plans.

"Kitchens, pantries, store rooms, servants' dining room and rear halls I group the same as on the second floor, as invariably these are all of some one style. Then take the number of feet of cupboards and any other incidentals that may appear to be called for.

"Then take off the stairs. Rear stairs from basement to attic, I usually put a value upon as I look at them on the plans. The main stairs I usually make a diagram of as to position of the newel, the start of the rail, the shape of the first two or three risers, the width of the stair, number of landing posts, the number of feet of level rail, which, of course, includes the well-hole casing. The raking rail will run about a foot to the tread. I make the price after seeing the style on which the stairs are built. I rarely ever lump a main stairs at so much. I figure a stair itself at so much per step, according to its design and the wood of which it is built; so much for the newel and each of the landing posts; so much per foot of rail, and so much additional for each ramp or casing.

"After taking off the doors on the first floor and whatever work there is in the basement, I am done with the plans, so far as the interior work is concerned, I then turn to the elevations and take off the window frames. While I already have the number, that does not enable me to make a price upon them, as their value may vary materially. This is my

method, taking each elevation consecutively: I put down on my pad the number of common double hung windows and then look at those which are special, and on them I put a value. The entry in my book then will be like this: '40 common windows, specials, $215.' The only thing that is now left is porches and roofs and cornices of bays and balconies.

Porches.

"Porches I take by the square foot—so many feet of floor and ceiling, so many feet of roof, so many feet lineal of beams and cornice, so many posts, so many feet of rail, so many feet of lattice. Bay roofs and cornice I measure in with porch roofs and cornice, as they generally are of the same style and value. Balconies I take off as they may appear.

"Having now completed taking off my quantities, my one object is to get the amount of surface I have to cover on the exterior and the nature of that covering, and in the interior to get the quantity and kind of the various items that go to make the complete whole. After having done this I read over the specifications carefully to see whether or not there may be something which I have overlooked in the more general reading at the first.

"I have described the taking off of quantities of a frame residence, but taking off the quantities of a brick residence does not vary materially, although there is not so much to take off. There is one item which I always make an entry of on a brick residence which I do not make on a frame residence: that is scaffolding."

Measuring Interiors for Millwork.

To measure millwork for interiors with any degree of accuracy, it is necessary that some definite plan be followed. The following scheme of taking measurements applied to the interior of an ordinary house three stories in height will be of service in this connection:

Top Floor.

First, go to the top floor, which is the third in this instance, and start by taking the measurements of all the windows. The handiest and quickest method is to take the sash sizes. Having this, and knowing the construction of the frames furnished, there is a good basis to work on. In this case there might be one twin box frame, 2 feet 5 inches by 4 feet 6 inches, one ¾-inch jamb, 1-inch center; one box frame, 2 feet 9 inches by 5 feet 2 inches, 1¼-inch; one skeleton window-frame, 2 feet 7 inches by 5 feet 2 inches, 3¾-inch seat.

After having taken all the windows, take the door sizes next. There may be an opening of 2 feet 10 inches by 6 feet 10 inches between the rough studs. This would mean a door of 2 feet 8 inches by 6 feet 8 inches. A stud, which may be 3 inches, would need a jamb of 4¾ inches. Whatever the size of the rough opening is, make the door 2 inches less, and the jamb 1¾ inches wider in size, than the rough stud. Where plaster-boards are used, this would be too wide; but in such a case the right allowance for the jamb would be made by determining the thickness of the wall finish. If the opening for the door is irregular in width—as for example, 2 feet 9 inches—then it is advisable to mark the studs with the correct size of the door which is to be furnished, so that there will be no mistake made by the carpenter when placing the jambs.

When taking the size of closet doors, make note of this fact, since in most cases closet doors are only 1⅛ inches thick, while others will probably be 1⅜ inches. The trim on closet doors should be noted, since it is frequently different on the inside in cases where there is a cabinet head finish on the outside. Also measure the openings for switchbox doors, which are usually made the inside size of the box.

After taking doors, measure up the baseboards or base, taking closets separately, since in most cases they are different.

Next take the base blocks, if any are needed. Then cornerbeads, stating how long, for some corners will not allow of a regular 4-foot stock head being used. Sometimes it happens that the corner is not at right angles, which must be stated, and the correct angle noted.

In most cases there is a plaster railing inclosing the staircase on the top floor. If this wall is 4 inches thick, furnish a cap 5¾ inches wide, nosed on both edges, calculating a piece of moulding the same kind as the base cap on each side of and under this nosed cap. These mouldings should miter into the base cap.

Next measure the closets for shelving and hook-rail.

Then take steps and risers, nosing, and strings for the stairs leading down to the second floor. These are usually the box kind; also measure the wall rail.

Second Floor.

Proceed with the second floor in the same manner as described above. It often happens that this floor has different kinds of wood in the different rooms, the front room being oak or chestnut, the bedrooms cypress or pine, and the bathroom poplar. It is advisable to mark on the plans the various kinds of finish to be used in the different rooms, so that there will not be so much chance of making mistakes. If there is a bay window on this floor, take note of the width of the space between the frames at the angles, for in many cases the regular trim is not wide enough, and a special trim must be made for these angles. If there is a window seat in this room, correct measurement must be taken of all angles, length, and depth, so that the seat will fit when sent to the job.

First Floor.

The first floor is usually the hardest to measure. Often there is a colonnade which joins into the staircase, therefore making accurate measurements necessary. If there is a paneled wainscot in the dining room, great care must be taken, or the panels will not fit. A circular bay window may also give trouble on this floor. If there is a paneled base or box seat, accurate measurement will be needed in this instance also. A definite plan should be used in taking measurements of this kind before proceeding.

The staircase may require the making of sketches in order to take down the scheme so that the stair man can readily understand what is meant. The one making measurements should be able to make a fairly good sketch either with instruments or freehand, since he is often required to sketch outlines of some ornamental work that has many curved lines and moldings which must be duplicated exactly.

The data should be explicit in every respect, so that the man who writes out the cutting list for the mill can understand it thoroughly without asking a lot of questions in regard to details.

The plans and specifications for a job should be studied carefully before proceeding to take off interior quantities. In many cases, there are some changes made, either in the plans or in the specifications, which should be noted in the estimate or contract. This sheet of "extras" should be taken along with the plans, and a note made to see that there are no extras put into the job without being noted on the slips containing the measurements.

A handy book to use in taking down quantities is one having loose leaves that can be removed and placed on file upon completion of the measurements. Sheets about 5 by 7 inches, and section-ruled are convenient in making sketches, and especially in taking measurements for staircases. A 4-foot rule and steel tape will prove useful in ordinary work.

Advantages of a Framing Plan.

In a previous chapter the advantage of having a framing plan to aid in taking off quantities was mentioned. From a construction point it is also very useful, as it gives opportunity to know where to place the joists to clear a soil pipe, or to allow for a header to be placed to take care of it; it enables one to know just what should be done and avoids

the hacking up of joists, etc., when the plumber comes, as it is up to the framer to allow places for the plumber.

A case in point is shown in Fig. XX. Here the soil pipe is a distance from the water closet, and the joists go across it. Even when framing plans are furnished by the architect a detail like the above will probably be overlooked. The best way to do is to make an 8-inch channel for the pipe by making diagonal headers as shown in Fig. XXX.

CHAPTER XXXI.

FIGURING PLASTER WORK

Details in the measurement of plaster work vary in different parts of the country. The ordinary unit of measurement on plain surfaces, such as walls and ceilings, is the square yard. The allowances necessary in measuring surfaces and quantities must be clearly understood for a given locality. The cost will vary with the price of materials and labor, and also with the number of coats used and the type of finish.

The standard rules for measurement of plastering, adopted by the Employing Plasterers' Association of Chicago, Ill., are as follows:

"Lath and plastering to be measured by the superficial yard, from floor to ceiling for walls, and from wall to wall for ceilings.

"In rooms containing one or more horizontal angles between the floor and ceiling line, the ceiling to be measured from wall to wall, as though all walls were vertical, for contents of ceiling; and from floor to highest point of ceiling, for height of wall.

"Openings in plastering to be measured between grounds. No deductions to be made for openings of 2 feet or less in width. One-half of contents to be deducted for openings 2 feet or more in width. The contents on all store front openings to be deducted, and the contractor to be allowed 1 foot 6 inches for each jamb by the height.

"All beams or girders projecting below ceiling line to have one foot in width by total length added for each internal and external angle.

Corner-Beads, Arches, Etc.

"All corner angles of more or less than 90 degrees, beads, quirks, rule joints, and moldings, to be measured by the linear foot on their longest extension, and one foot for each stop or miter.

"Length of cornices to be measured on walls. Plain cornices of 2 feet girth or less, to be measured on walls by the linear foot. Plain cornices exceeding 2 feet to be measured by the superficial foot. Add 1 linear foot to girth for each stop or miter. Enriched cornices (cast work), by the linear foot for each enrichment.

"Arches, corbels, brackets, rings, center pieces, pilasters, columns, capitals, bases, rosettes, bosses, pendants, and niches, by the piece. Ceiling or frieze plates over 8 inches wide, by the square foot.

"Columns to be measured by the linear foot for plain plastered columns.

"Cement wainscot to be measured by the square foot, openings to be allowed as for plain plaster.

"Grounds for various classes of work to be as follows, unless expressly specified to the contrary:

	Inches
Grounds for 2-coat lath work	⅞
Grounds for 3-coat lath work	1
Grounds for 3-coat metal lath work	⅝
Grounds for 3-coat metal lath work on ½-inch iron framing	1⅛
Grounds for 3-coat metal lath work on 1-inch iron furring	1⅝
Grounds for hard mortar metal lath work	⅝
Grounds for hard mortar metal lath work on ½-inch iron furring	1⅛
Grounds for 2-coat work on brick or tile	⅝
Grounds for hard mortar lath work	¾

Where metal lath is spoken of, it applies to all wire or metal lath.

Other rules for measurement allow one-half the area of openings for ordinary doors and windows, while some make no allowance for openings of less than 7 square yards. Returns of chimney-breasts and pilasters, and all strips less than 12 inches wide, are measured as full 12 inches.

In closets, the actual measurements are increased by one-half; and if shelves are in place before plastering, the actual measurement is doubled.

For soffits of stairs, raking ceilings, or places difficult to reach, the actual measurements are increased by one-half.

Round corners and arrises are measured by the linear foot.

Circular or elliptical work should be charged at double measurement.

Lathing.

Wood laths vary in dimensions; but the common size is 1½ inches wide, ¼ inch thick, and 4 feet long. This length allows proper nailing to studding spaced either 12 or 16 inches on centers.

In nailing, the laths should have a nail to each bearing, and often two nails are required at the ends of each lath. In ceiling work, five nailings to a lath is preferred.

The spacing of laths for ordinary lime mortar should be about ⅜ inch in the clear, and about ¼ inch for patent or hard plasters. Joints in lath work should be broken about every sixth lath.

When laths rest on a bearing surface over 2 inches in width, strips of wood should be placed under the lath so as to allow a space for keying the plaster.

Wood laths are sold by the thousand, in bundles usually containing 50 laths. One thousand laths, if dry, will weigh about 500 pounds, but if wet or green will weigh about double this amount.

Quantity estimates may be based on about 1,500 laths of standard size for each 100 square yards of surface. This allows for a moderate number of angles, brackets, etc. Where work is divided into small or irregular surfaces, this quantity may vary considerably.

About 10 pounds of three-penny nails will be required for each 100 square yards of wood lath.

Plaster-Board.

Many varieties of patented wall-boards are to be found on the market. These boards are used in the place of wood or metal lath, and are of service as a fireproof covering or for sound-deadening.

Sizes of any particular board may be obtained from the literature of the manufacturer, together with directions for applying same to walls. A common size for plaster-board is 32 by 36 inches. Thicknesses vary from ¼ to ½ inch, but the standard board weighs about 1½ pounds per square foot.

In using plaster-board, the grounds will vary from ¾ inch for boards ¼ inch thick to not less than ⅞ inch for a board ⅜ inch thick. The boards are nailed directly to the studding, furring strips, or joists, with the plastering side out. The center of the board is nailed first, and the edges last. A space of ¼ inch is left between boards, and each edge of the board must have a bearing on the nailing piece of at least ¾ inch.

In applying on wood studding or joists, use 1¼-inch, 11½ gauge, 7/16-inch head, smooth wire nails set 4 inches apart, with each nail driven in firmly.

On ceilings where leveling is required, 7/8-inch by 2-inch furring strips should be used, set on 8- or 12-inch centers.

Metal Lath.

There are many kinds of metal lath on the market, varying from wire lath made from woven wire reinforced with rods or V-shaped strips, to sheets of expanded sheet steel either of the plain type or of the ribbed and perforated type. The sizes and rolls and sheets of these materials vary to such an extent that it is necessary to consult the catalogues of the manufacturers in order to determine the number of rolls or bundles of a given kind of material needed.

One pound of 7/8-inch wire staples will fasten on about 10 square yards of wire or metal lath.

There are a great number of patent or hard wall plasters on the market, sold under various names. The composition of these plasters is nearly the same, the hardness depending upon the proportion of plaster of Paris or prepared gypsum used in their manufacture. These plasters give good satisfaction and make a hard, durable job. For quick work, or for use in cold weather, they are preferable to lime plaster, as they will set and harden much more rapidly.

The covering capacity of the different patent plasters varies from 90 to 150 square yards per ton of plaster. In estimating on this class of work, it is advisable to follow the quantities given by the manufacture of the kind of plaster used.

Lime.

Lime is sold in most of the eastern cities, by the barrel weighing 200 pounds net. If shipped in bulk, it is generally sold by the bushel. A bushel of lime is figured as 80 pounds, or 2½ bushels to the barrel.

A barrel of the best lime will swell to about 2 3/5 the bulk of the unslaked lime. It is generally estimated that a barrel of lime will make about 8 cubic feet or 20 pails of lime paste or putty.

Experience has shown that the best mortar is made by mixing 1 part lime paste to 2 parts sand.

Three-Coat Work.

The first or scratch coat is made up of first-quality lump lime, clean, sharp bank sand, and the best quality of clean, long cattle hair, mixed in the proportion of 5⅓ barrels of sand and 1½ bushels of hair to each cask or 200 pounds of lump lime. All materials are stacked in the rough for at least 7 days before using.

The second or brown coat is made up in the same manner as the scratch coat, except that 6½ barrels of sand and ½ bushel of hair are used to each 200 pounds of lime. This second coat should be leveled and floated so as to be true at all points.

The third coat may be either a white or putty coat or sand finish. If a white coat is used, it is made up of lime putty and equal parts of plaster of Paris and marble dust, or lime putty and some kind of hard wall plaster.

Two-Coat Work.

In two-coat work, the first or scratch coat described in three-coat work, is brought nearly to the grounds, and carefully straightened to receive the finishing coat.

The finish or skim coat in two-coat work is made up of nearly equal parts of lime, sand, and plaster of Paris.

Hydrated Lime.

Hydrated lime is simply pure lime in a powdered form—thoroughly slaked and screened when obtained in the commercial form. It is handled and treated as pure lime. In the preparation of putty it must be thoroughly soaked and cured for 12 to 24 hours, the same as putty made from lump lime. The use of hydrated lime saves the cost and labor of slaking and running off lump lime.

Keene's Cement.

This material is made by re-calcining plaster of Paris after soaking it in a solution of alum. It is used in work on wainscots, caps, bases, and also as a hard finish.

The first coat is made up of 1 part cement, 1 part lime paste, and 3 parts sand.

The second coat is made up of 1 part cement, 1 part lime paste, and 4 parts sand.

For the first coat work, 1 ton of Keene's cement will coat about 475 square yards. In brown coat and white hard finish, 1 ton will cover about 300 square yards. In the first and second coat work, 1 ton will cover about 350 square yards.

If Keene's cement is used for brown coat, and Keene's finish on expanded metal lath, 100 square yards of surface will require 550 pounds of cement, 5½ bushels of lime, 2 cubic yards of sand, and 2 bushels of hair for the brown coat, with 300 pounds of cement and 1 bushel of lime for the finishing coat.

Lafarge Cement.

Lafarge cement is often used for outside stucco work. It should be mixed as follows:

First coat, 1 part cement, 3 parts sand, 25 percent lime paste, and sufficient hair.

Second coat, 1 part cement, 2 parts sand, and 10 percent lime paste.

One barrel of cement and 3 barrels of sand will cover about 34 square yards ⅜ inch thick.

One barrel of cement and 2 barrels of sand will cover about 25 square yards ⅜ inch thick.

Mixing and Estimating Quantities for Plaster Work.

For scratch work, 350 pounds of hydrated lime and ¾ cubic yard of screened sand should cover 100 square yards.

For second coat, 200 pounds of hydrated lime and ½ cubic yard of screened sand should cover 100 square yards.

For float finish, 300 pounds of hydrated lime and ¼ cubic yard of screened sand should cover 100 square yards.

For stone mortar, add 200 pounds of hydrated lime to ⅝ cubic yard of screened sand.

For brick mortar, add 250 pounds of hydrated lime to ⅝ cubic yard of screened sand. This quantity should lay from 1,000 to 1,200 brick.

For cement mortar, use 100 pounds of Portland cement, 150 pounds of hydrated lime, and ⅜ cubic yard of screened sand.

For waterproofing concrete blocks, 15 to 20 percent of hydrated lime based on the weight of Portland cement used will give good results when mixed with the other materials used.

Quantities of Materials for Plaster Work.

For 100 square yards of 3-coat lime plaster work on wood lath, allow 10 bushels of lime, 42 cubic feet of sand, 15 pounds of hair, and 100 pounds of plaster of Paris.

For scratch and brown coat only, omit the plaster of Paris, and deduct 2 bushels of lime.

For sand finish on scratch and brown coat, omit the plaster of Paris, and add 14 cubic feet of sand.

For 2-coat work on brick, stone, or terra-cotta walls, deduct 2 bushels of lime, and use 100 pounds of plaster of Paris.

In white coat work, 90 pounds of lime, 50 pounds of plaster of Paris, and 50 pounds of marble dust will be needed for each 100 square yards.

In skim coat work, 1 barrel of lime, 1 barrel of plaster of Paris, and 1 barrel sand will cover about 140 square yards.

Hard wall plasters vary from 90 to 150 square yards per ton of plaster.

Pulp or fiber plaster vary from 130 to 170 square yards per ton of plaster.

Cattle hair comes in bags containing one bushel of loose material, and weighing 6 or 7 pounds.

Two-coat drawn work requires about 1,000 pounds of hard wall plaster and finish, and 2 yards of sand, for each 100 square yards.

Three-coat dry work requires about 1,600 pounds of plaster and finish, and about 2½ cubic yards of sand for each 100 square yards.

Three-coat work on metal lath requires about 2,200 pounds of plaster and finish, and about 3 cubic yards of sand for each 100 square yards.

FIGURING THE TILE

Tiling is usually figured by the square foot, and it is an easy matter to find out the area of a floor or a wainscot and by the use of the table below the number of tile can be easily found, as the table gives not only the shape and size of many of the common tiles, but also the number of each kind required to fill exactly one square foot of space. An allowance of a small number should be made for breakage and losses.

For example, if we have a section of tile wainscoting 8 feet long and 5 feet high, composed of oblong white tiles 6 by 1½ inches in size, and a border along the top made from blue and white triangular, or diagonal, tile 6 by 6 inches in size, to find the number of tiles needed for this piece of work, we proceed as follows:

The area to be covered by the oblong tiles is 8 feet long and 4½ feet high.

$$8 \times 4\frac{1}{2} = 36 \text{ square feet.}$$

There are 144 square inches in one square foot; therefore,

$$36 \times 144 = 5{,}184 \text{ square inches.}$$

Now, since 1 oblong tile, size 6 by 1½ inches, contains $6 \times 1\frac{1}{2} = 9$ square inches, the exact number of tiles needed for the part 8 feet long below the border is:

$$\frac{5{,}184}{9} = 576 \text{ tiles.}$$

Better make this 600, to allow for loss and breakage.

Now that we have seen the principle involved in this calculation, we shall explain the method of using the table and see if the results check in value. From our figures above we have 36 square feet below the border. This space is to be filled with 6x1½-inch tiles. From the table, the number of 6x1½-inch oblong tiles which are necessary to cover one square foot of surface is 16. Therefore,

$$36 \times 16 = 576 \text{ tiles required.}$$

This result checks with our first figures.

For the border of diagonal tiles, we have an area 8 feet long by ½ foot high which is to be filled.

$$8 \times \frac{1}{2} = 4 \text{ square feet.}$$

From the table (second line from top), we find that we shall need 8 diagonal 6 by 6-inch tiles per square foot. Therefore,

$$4 \times 8 = 32 \text{ tiles required for border.}$$

Better make this 40, to allow again for loss and breakage. This would mean 20 blue and 20 white diagonal tiles.

This same principle may be used in figuring other sizes of walls, and in using other sizes of tiles.

CHAPTER XXXII.

FIGURING THE PAINTING

When both ends and both sides of a building are of the same size, it is necessary to measure one end and one side only; then double these dimensions, and multiply their sum by the height to the eaves. If the building is of irregular outline or is cut up considerably, it is best to run the line completely around the building, taking care to include all the angles. In this way, the circumference is obtained, which, if multiplied by the height to the eaves, gives the number of square feet of area in the wall surface to be covered.

Next, measure the gables. The areas of gables may be found by multiplying the height by the width of the end of the house, and dividing the result by 2. If both gables of the building are alike, multiply the area of one gable by 2.

Porches and verandas, dormer windows, bay windows, cornices, and other additions to a building must be measured separately, and noted in a different place on the estimate sheet, since the labor rate on these items will be different from that on flat surfaces of large area.

Plain work on cornices, verandas, etc., is often figured by the linear foot instead of by the surface area. Fancy latticework or large capitals on columns will have to be estimated in each individual case.

Dormer windows, bay windows, etc., may be estimated by the lump sum for each one, remembering that the location of the dormer will make the labor cost higher than on straight walls.

Gutters and downspouts may be estimated by the linear foot. On small jobs, it is not difficult to estimate the time needed for this class of work. The amount of surface to be covered may be obtained from tables of areas, provided the dimensions of the spouts and gutters are known.

No deduction has been made for window and door openings in figuring surfaces to be covered. Wall spaces are usually measured solid, and it is estimated that the time spent in cutting around sashes, frames, etc., is as much as would be required in painting a smooth surface the size of the openings.

If there are a great many small openings, or if there are a large number of small lights to be cut around, an additional charge of one or two cents per square yard should be made.

If the roof is to be painted or stained, the number of square feet of surface in the roof should be measured.

Store fronts should first be measured as in the case of other surfaces. Then double, triple, or quadruple this measurement, according to the amount of work on the front. The height of a front or surface must be taken into consideration, and the amount of difficulty to be met in placing ladders, hanging stages, etc. Large fluted columns with ornamental tops, fancy cornice, frieze, etc., may require that the measurements be tripled in order to arrive at a proper labor cost.

Prices of labor and materials vary greatly in different parts of the country, and these are the main items to be taken into consideration. The conditions and surroundings of each individual job must be considered in attempting to fix a cost. If the surface to be painted is peeling, blistered, or in a bad condition which requires much scraping or burning off, the cost of the work will be higher. If a job is located at some distance from the shop, the cost of hauling equipment and materials to and from the job must be added.

Official Rules for Measuring.

In order to give some basis by which estimates for painting work could be intelligently made, the National Association (now the International Association) of Master House Painters and Decorators appointed a committee, about the year 1892, to devise a system of measurements which would be practicable for the entire country. This committee took two years to perform its work, and finally reported at the convention held in Baltimore, February, 1894, giving a very practical system whereby all classes of work were reduced to a basis of square yards of plain painting. For example, latticework, when painted on one side only, is to be measured by multiplying three times the height by the length.

Some of the more important rules of the system of measurement are given in the following:

Outside Measurements.

Clapboarded Walls.—Add one square foot to each square yard of measurement to allow for under edges of boards.

Flat Brick, Wood, Cement, or Stone Walls.—Measure height by width, and add area of openings.

Cornices (if plain).—Multiply the length by 1½ times the girth; on high buildings, where the walls are not to be painted, by 4 times the girth.

Bracket Cornices.—The length to be measured by from 3 to 8 times the girth, according to ornamentation and height above ground.

Outside Blinds.—Multiply the height by twice the girth for stationary, and by three times the girth for rolling slat blinds. Height by twice girth for shutters.

Door Frames.—If 6 inches or less in girth, the girth to be counted as 1 foot, and allow double girth for all in excess of 6 inches, multiplying by the length all around.

Doors.—Batten doors, add 1 inch to girth for each bead or batten, and measure square. Paneled doors, double the area. Measure edges twice on account of lock face and butts.

Window Sash.—If plain, measure the height by 1½ times the width; if fancy, by 3 times the width.

Balustrades.—Take 4 times the height of one side, with the top surface of upper and lower rail added, and multiply by the length of the baluster rail.

Columns.—When plain, multiply the height by 1½ times the girth; when fluted, by twice the girth, pressing the tape into the flutes.

Capitals.—Multiply the height by from 3 to 10 times the girth.

Tin Roofs.—Measured square.

Plain or Beaded Sheathing Ceilings.—Multiply twice the length by the width, adding 1 inch to the width for each bead.

In dipping shingles, estimate at 400 square feet for each 1,000 shingles.

Floors.—Square measurement.

Chimneys, Conductors, Spouts, Barge Boards, Crestings.—Four times the girth multiplied by the length.

Inside Measurements.

Ceilings.—If washed and tinted, double surface. If washed, sized and tinted, 3 times the surface.

Walls.—Make no allowance for openings if the finish is of hardwood, and allow one-half the area of openings if the finish is to be painted. If walls to be washed and tinted, add one-fourth to surface measurement, and make no deduction for openings.

Interior Wood Finish.—If from 4 to 6 inches in girth, count as 1 foot; 12 and 18 inches, count as 3 feet. Add 1 foot to the perpendicular height for corner blocks.

Baseboard.—Allow not less than 1 foot for height; and when base and molding exceed 10 inches, count them as 15.

Paneled Dadoes.—Two or three times the area.

Painted Floors.—One and one-half times the area; double area for hardwood floors. Parquet floors, from 3 to 5 times the area.

Mouldings less than 4 inches in width, and separated from other finish, to be counted as 1 foot.

Doors, Window Frames, Columns, Etc.—The same rules as for outside measurements.

To the above measurements might be added the following:

Iron Gratings, Screens, or Bars.—Measure area of surface covered, and multiply by 4 or 6 as the case demands.

Handrails, Buttresses, Stairs, and Steps.—Multiply surface measurement by 2.

Skylights.—Multiply surface measurement by four.

Iron Fences.—Fancy cast-iron work, 4 times the height of one side multiplied by length. Bar or pipe work, circumference of pipe multiplied by length of fence.

Board or Picket Fences.—Twice the height of rails or pickets, and girth of same, multiplied by the length of fence with circumference of posts added.

Domes and Cupolas.—Multiply the girth at the base by the greatest height, and this result by 3.

Spires.—If plain boarded, multiply the greatest girth by double the height.

Single Doors.—Measure as 35 square feet for each side, including trim.

Interior Side of Windows.—Same as for single doors.

Woodwork in Bad Condition.—Add from one-tenth to one-half to the measurements given above.

Quantities of Materials for Painting.

Where the contractor has learned by experience to judge reasonably well as to the time required for doing a given piece of work, then the labor and material may be figured separately. It then becomes needful to know the average covering capacity of white lead or such other paint as may be used. This depends very much on the condition of the surface to be covered and its degree of absorption, as well as on the particular material employed and the fineness to which it is ground.

In figuring from plans the painter not only needs to look over the specifications for his own work, but he must also examine carefully the specifications for other mechanics, since often there are items called for which do not appear on the plans, but which require painting or hardwood finishing. Sometimes the mantels are furnished by the owner ready-finished from the factory, while at other times the painter must finish them. It is well to read carefully the specifications for the plasterer, the plumber, and the steamfitter. Among other things that the painter should carefully consider are the kinds of wood for interior finish; the kinds of wood for the floors, and whether they are to be finished; whether the cellar woodwork is to be finished by the painter, or whether he has whitewashing to include in his estimate.

Who is to finish the radiators?

Is the kitchen sink to be bronzed with aluminum?

And the same of the outside of the sink.

What walls, if any, are to be calcimined or frescoed?

Are there wood or plaster cornices to be finished?

Look out for wainscots, kitchen dressers, pantry fittings, seats, or other wood fittings requiring finishing.

Covering Capacity of Paint.

For white lead, under average conditions of surface, the area (in square feet) divided by eighteen will give approximately the number of pounds of white lead in oil that will be needed to do a good three-coat job of painting. The area (in square feet), divided by 200, will give approximately the number of gallons of white lead paint that will be required to do the work, two coats. There would be very little difference in the number of gallons of any good mixed paint that would be needed.

One pound of paint will cover from 3½ to 4 square yards of wood for the first coat, and from 4½ to 6 square yards for each additional coat; on brickwork it will cover about 3 square yards for the first coat and 4 square yards for the second coat.

One pound of putty, on an average, will be sufficient for about 20 square yards of wall or ceiling where stopping (filling cracks, etc.) is needed.

One pound of wax will cover about 125 square feet of surface.

One pound of glue, mixed with two gallons of water, for sizing, will cover about 100 square yards of surface.

One gallon of ready-mixed paint will cover 250 to 300 square feet of wood surface one coat, or 175 to 225 square feet two coats, or 125 to 150 square feet three coats.

One gallon of paint, emerald green, will cover about 25 square yards.

One gallon of paint, yellow, will cover about 44 square yards.

One gallon of paint, stone color, will cover about 44 square yards.

One gallon of paint, white, will cover about 44 square yards.

One gallon of paint, zinc white, will cover about 50 square yards.

One gallon of paint, prime color, will cover about 50 square yards.

One gallon of paint, black, will cover about 50 square yards.

One gallon of paint, green, will cover about 45 square yards.

One gallon of paint, bronze green, will cover about 75 square yards.

One gallon of mixed paint will cover from 25 to 30 square yards on stonework; 80 to 90 square yards on ironwork; and 40 to 50 square yards on plaster.

One gallon of mixed paint will cover about 125 square feet of brickwork for the first coat, or about 300 square feet for the second coat.

One gallon of shellac will cover 700 to 750 feet one coat.

One gallon of water stain will cover 650 square feet on open-grained woods; 750 square feet on close-grained woods, and about 500 square feet on soft woods.

One gallon of spirit stain will cover about ½ the capacity of water stains.

One gallon of oil stain will cover about 600 square feet on either hard or soft woods.

Covering Capacity of Shingle Stains.

The following estimate of covering capacity of shingle stain is based on the average cedar shingle, size 4 by 16 inches.

On gallon of stain will cover 150 square feet one brush coat, or 100 square feet two brush coats.

Two and one-half to 3¾ gallons of stain will dip 1,000 shingles. Two-thirds of length of shingle to be dipped.

Three gallons of stain will dip and brush coat 1,000 shingles in some cases.

The covering capacity of creosote bleaching oil is about one-fifth less than the above figures.

One gallon of paste filler reduced for use will cover about 300 square feet.

One gallon of liquid filler, hard oil finish, or varnish will generally cover from 350 to 400 square feet for first coat, and from 400 to 500 square feet for subsequent coats.

One gallon of enamel will cover about 260 square feet on plaster, one coat.

One gallon of varnish remover will treat about 150 square feet.

In estimating per square of surface covered, the following proportions are often followed:

Where lead and oil primer is used, new woodwork requires 3¾ pounds of white lead, 1 quart linseed oil, and a little under ½ pint of turpentine per square (100 square feet) of work. If used on common brickwork, 8¼ pounds of white lead, ½ gallon of linseed oil, and a little over ½ pint of turpentine per square.

Coats other than priming coats require 2½ pounds of white lead, 1 pint of linseed oil, and ⅛ pint of turpentine per square for woodwork, and 3½ pounds of white lead, 1 quart of linseed oil, and ¼ pint of turpentine per square on common brickwork.

CHAPTER XXXIII.

FIGURING THE PLUMBING, GAS FITTING, HEATING, SHEET METAL AND ELECTRICAL WORK

Notwithstanding the importance of the plumber's work, it is as a rule given very little attention by the average architect in the preparation of plans and specifications. The plans may show a toilet room located here, a sink there, lavatories scattered promiscuously about; and there may be a few lines on the basement plan to indicate the general direction of the sewer, but seldom more. It therefore falls to the lot of the plumber to figure, if he can, how to reach the various fixtures with his lines. He must also find the best locations he can for water-heaters, pumps, and tanks; also where to install the risers and vent lines. The incomplete nature of the drawings is very often recompensed, to some extent, by carefully outlined specifications, although these may at the same time be inadequate and indefinite, abounding in such terms as "pipes of ample size," "valves satisfactory to the architect," "water-heater of sufficient capacity," etc., thus placing upon the plumber practically the entire responsibility for the designing and proper working of the system.

A big aid in taking off a list of the material needed for the plumbing is to draw out a diagram of the entire system, both drainage and water supply. The positions of all mechanical appliances in connection with the plumbing should be clearly shown, upon whatever floor plan such appliance may be located. All runs of piping through basement, together with the size of same, should be concisely indicated in the basement drawing. House traps, bell traps, area drains, sump pits, conductor lines, etc., should be located beyond dispute. Branches to risers, with size plainly indicated, together with location of such risers, should be shown; and valves and stop-cocks should be plainly indicated besides the necessary fittings.

Plumbing Details.

In addition to the plumbing lines shown on the plans, there should be prepared a riser diagram showing the serving of each and every fixture on each floor of the building. This riser diagram should show clearly all water lines, waste lines, soil lines, vent lines, fire lines, etc., at each and every floor throughout the building, giving the relative position and arrangement of the waste and vent lines for each fixture, with the sizes of all lines plainly designated. Pipes of the various characters can be indicated by different kinds of broken or dotted lines, with a properly arranged index on the drawing, showing the kind of service each line performs.

If the plans and specifications do not give it, find out and mark on your diagram the location, size, depth, and general direction of the street sewer, if there is no sewer, the final disposition of the sewerage should be given in detail, giving the distance to the cesspool or septic tank, etc.

The location and size of the city water main from which the water supply is to be taken should be plainly marked along with the water pressure at source of supply. This information can be obtained in any well-regulated municipality, where it is always kept on file.

The specification should list accurately the number of each style of fixtures to be located on each floor of the building, and should give such an accurate and detailed description of such fixtures and the trimmings as to leave no doubt as to what is desired. In cases where the fixtures are not listed make up a list giving the sizes, etc., so that you can refer to it.

By going over the diagram a list of the materials can be readily taken off, as you will have every pipe, its size and length, the different fittings, valves, etc., all before you.

What is true of the plumber's work also applies to the heating, gas fitting, and electrical work. Draw a diagram of the entire system and then take off the list of the material required.

Gutters and downspouts are frequently not fully specified. They are usually made of galvanized iron or copper, but often gutters are made in the form of a lumber trough lined with

sheet metal. Lead, tin, or zinc may be used for this purpose. Where the side of a gutter touches a wall, the side should be turned up at least 6 inches against the wall and covered with an apron. If gutters are formed along the eaves, the gutter metal should be turned up against the roof boards for at least 10 inches and securely nailed.

The slope of gutters should be about ⅛ inch for each foot of length.

Sizes of Gutters and Spouts.

A way to determine the size of downspouts for a roof is given in the following:

2-inch pipe will drain 3½-inch gutter 12 feet long.
3-inch pipe will drain 3½-inch gutter 12 to 25 feet long.
3-inch pipe will drain 4-inch gutter 25 to 35 feet long.
4-inch pipe will drain 5-inch gutter 35 to 45 feet long.
5-inch pipe will drain 6-inch gutter 45 to 55 feet long.
6-inch pipe will drain 7-inch gutter 55 to 65 feet long.
7-inch pipe will drain 8-inch gutter 65 to 75 feet long.

The quantities are very easily taken off the plans and elevations. Flashings are also easily measured from the plans.

CHAPTER XXXIV.

FIGURING THE HARDWARE

When listing the hardware needed, a careful record should oe made, containing the name of each article, the quantity desired, any necessary features it must possess which are out of the ordinary, and its exact location in the building.

A plan of each floor of the building showing locations of doors, windows, closets, etc., may be used to advantage in connection with such a list as that just mentioned. Each door or window should be given a number which will serve to locate the hardware on the list when tagged with a similar number. It is good policy to give each different article on the list a number to designate what the article is, and whether it is for a door, window, transom, miscellaneous, etc. article needed at that place. In that way the number of pieces or each article desired can be readily counted up on the plans.

The plans shown in Fig. 174 are marked in the way indicated. From the list of articles following, numbered as suggested, a quantity sheet has been made up. This sheet is only approximate, as its sole object is to show the method to be followed.

Hardware for Doors.

1—Loose-pin, wrought steel, Bower-Barffed, butts with tip, 4 by 4.

2—Loose-pin, wrought steel, Bower-Barffed, butts with tip, 2 by 2.

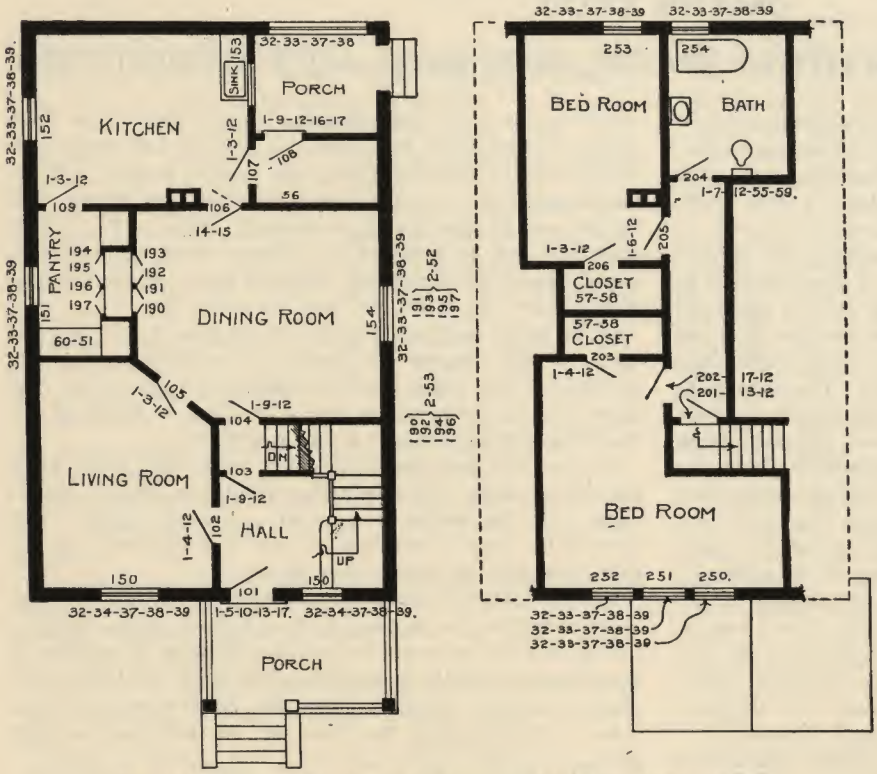


Fig. 174—House plans showing layout of hardware items needed.

3—Knob-latches, R. H.
4—Knob-latches, L. H.
5—Knob-latches, stopwork and pass key R. H.
6—Knob-latches, thumb-bolt, R. H.
7—Knob-latches, thumb-bolt, L. H.
8—Knob-latches, dead-bolt, R. H.
9—Knob-latches, dead-bolt, L. H.
10—Brass knobs.
11—Mineral knob.
12—Jet knob.
13—Chain-bolt.
14—Double-acting butts.
15—Push-plate.
16—Heavy iron bolt.
17—Push-button for electric bell.
18—T-hinge, 14 inches.
19—Padlock and chain.
20—Heavy iron thumb-latch.

Hardware for Windows.

31—Fast-pin, plain steel butts, 3 by 3.
32—Pulleys, 2-inch on running face.
33—Sash-lifts, hook.
34—Sash-lifts, handle.
35—Cellar window fastener.
36—Wire hook and eye.
37—Sash-lock.
38—Sash-cord.
39—Sash-weights.

Miscellaneous Hardware.

51—Drawer-pulls.
52—Cupboard spring catches.
53—Elbow catches.
54—Loose-pin butts, with tips, 3 by 3.
55—Towel hooks.
56—Coat hooks.
57—Wardrobe hooks.
58—Wire closet hooks.
59—Toilet-paper holder.
60—Hinges for flour bin.

In the following example, articles for doors are numbered from 1 to 30; for windows, from 30 to 50; and miscellaneous, from 50 upwards. First floor doors are numbered from 100 to 150; first floor windows, from 150 to 190; and closets and cupboards, from 190 to 200. Second floor doors are numbered from 200 to 250, etc.

On the plan, at each door, window, closet, or other place where hardware is needed, insert the number standing for the

TYPICAL SCHEDULE FOR ORDERING HARDWARE.

The accompanying schedule of hardware is typical for use in modern residence. It contains the information required to make a perfect working list of goods. It is suggested that the carpenter adopt this schedule as a regular form. If the order has to be sent in to the hardware manufacturer, it cannot be supplied correctly unless most of this information is sent in with the order.

Schedule of Hardware for Typical Residence.

First Floor.

Dull brass finish on front of double-acting door to pantry and on front of door from hall to rear hall; Bower-Barff finish on rear part.

1 single 1¾-inch front entrance sash door, 3 feet by 7 feet 6 inches, right, 26-inch glass.
1½ pairs brass butts, 4½ by 4½, dull brass finish.
1 push button to match.
1 set cylinder front door lock; knobs and escutcheons, Change A.

Note.—Change A refers to pattern of key for lock.

1 single glass 1¾-inch vestibule sash door, 3 feet by 7 feet 6 inches, right hand 26-inch glass.
1½ pairs steel butts, 4½ by 4½, dull brass finish.
1 set cylinder vestibule lock; knobs and escutcheons; Change A.

1 double sliding door, hall to parlor, 6 feet by 7 feet 6 inches, opening.
3 sliding door pulls, dull brass finish.
6 cup escutcheons; no keyholes.

1 1¾-inch door, hall to coat closet, 2 feet 6 inches by 7 feet.
1 pair steel butts, 4 by 4, dull brass finish.
1 set 1-tumbler locks; knobs and escutcheons.

1 1¾-inch door, hall to back hall.
1 pair butts, 4 by 4, Bower-Barff finish.
1 set thumb-bolt lock, knobs, and escutcheons; dull brass and Bower-Barff. Thumb-piece in front hall so servant is locked in servant's portion of the house.

1 1¾-inch double-acting door, dining room to butler's pantry.
1 set spring hinges, dull brass and Bower-Barff.
1 push-plate, dull brass finish.
1 push-plate, Bower-Barff finish.
1 door holder, Bower-Barff finish.
1 mortise thumb-bolt, dull brass finish.
Thumb-piece in dining-room to lock against servants.

1 1¾-inch door, kitchen to pantry.
1 pair butts, 4 by 4, Bower-Barff finish.
1 set 1 tumbler lock, knob and escutcheons, Bower-Barff finish.

1 single-sliding door, hall to dining room, 3 feet by 7 feet 6 inches, opening.

1 1¾-inch, kitchen to basement.
1 pair butts, 4 by 4, Bower-Barff finish.
1 set 1 tumbler lock, knob and escutcheon, Bower-Barff finish.
1 mortise thumb-bolt.

1 1¾-inch rear entrance door to kichen.
1½ pairs butts, 4 by 4, Bower-Barff finish.
1 set 3-tumbler locks, knobs and escutcheons, plain bronze and Bower-Barff.
1 cylinder rim night latch. Change B.
1 door-fast.

Note.—Change B is to differ from, yet to be passed by Change A, which are alike.

1 pair 1¾-inch open-in French doors, porch to living room, open 90 degrees, 2 feet by 7 feet 6 inches.
3 pair brass butts, 4½ by 4½ dull brass finish.
2 lever extension bolts on edge, 12-inch and 18-inch rod.
1 set thumb-bolt lock, 1⅜-inch, backset; lever with oval rosette; outside knob with 2½-inch rosette, and thumb-knob inside for 2½-inch stiles with T astragal.

QUANTITY SHEET

Number of Door	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Notes
Basem't Door	3															1				1	
Area way Door																		2	1		
101	3			1						1			1				1				
102	3		1									1									
103	3								1			1									
104	3								1			1									Reverse Bevel Latch
105	3		1									1									Reverse Bevel Latch
106														1	1						
107	3		1														1				
108	3											1				1	1				
109	3		1						1			1									Reverse Bevel Latch
										Pairs.			Pairs.		Pairs.			Pairs.			
201	3		1									1									
202	3						1					1									
203	3			1								1									
204	3						1					1									Reverse Bevel Latch
205	3				1							1									
206	3		1									1									Reverse Bevel Latch
Total	45		5	2	1	1	2		3	1		13	1	1	1	2	2	2	1	1	

No. of Window	31	32	33	34	35	36	37	38	39												
6 Cellar Windows	12				6	6															
Scuttle						2															
150		4		2			1	15	4												
151		4	2				1	15	4												
152		4	2				1	15	4												
153		4	2				1	15	4												
154		4	2				1	15	4												
155		4		2			1	15	4												
250		4	2				1	15	4												
251		4	2				1	15	4												
252		4	2				1	15	4												
253		4	2				1	15	4												
254		4	2				1	15	4												
Total	12	44	18	4	6	8	11	165	44												
								Feet													

Location	51	52	53	54	55	56	57	58	59	60	2										
Pantry	12									1											
Bath Room					6				1												
190			1								3										
191		1									3										
192			1								3										
193		1									3										
194			1								3										
195		1									3										
196			1								3										
197		1								Pair	3										
Back Entry						6															
Chamber Closets							24	24													
Total	12	4	4		6	6	24	24	1	1	24										

1 pair 1¾-inch open-in French doors, porch to dining room, open 180 degrees, 2 feet by 7 feet 6 inches.
3 pair brass butts, 4½ by 6, dull brass finish.
2 flush extension bolts on face of door, 12-inch and 18-inch.
1 set thumb-bolt lock, 1⅜-inch backset; level with oval rosette; outside knob with 2½-inch rosette, and thumb-knob inside for rabbet ½-inch deep, stiles 5-inch between glass.
The above lock can be put in upside down, so hand of door need not be noted.

1 pair 1¾-inch open-out French doors, 2 feet by 7 feet 6 inches.
3 pair brass pin galvanized butts and screws, 4½ by 4½.
2 flush extension bolts on face of door, 12-inch and 18-inch, dull brass finish.
1 set thumb-bolt lock, 2-inch backset, lever and oval rosettes both sides of door, with thumb-knob inside for 2½-inch stiles, with T astragal on outside.

1 pair 1¾-inch open-in French windows on dining room, 2 feet by 7 feet 6 inches; open 90 degrees.
3 pair butts, brass, 4½ by 4½.
1 Cremorne bolt, dull brass finish, 7 feet 6 inches long, knob in middle.

1 single 1¾-inch open-in casement sash, dining room, 18-inch glass; open 90 degrees.
1 pair brass butts, 3½ by 3½ inches.
1 ring handle, fast with wide strikes.

1 adjuster, 12-inch rod, stool depressed ⅝ inch and stool 2½ inches wide.
1 single 1¾-inch open-in casement sash, 18-inch glass; open 180 degrees.
1 pair Stanley parliament loose-pin butts, 6-inch, dull brass.
1 fast, as above.
1 adjuster, as above.
1 pair 1¾-inch open-in recessed casement sash; open 90 degrees.
2 pair Stanley parliament loose-pin butts, 6 inches.
2 flush-bolts, 6-inch, having ⅝-inch angle.
1 fast, as above.
2 adjusters, as above.
1 single 1¾ open-out casement sash.
1 pair brass-pin galv. butts, 3½ by 3½.
1 ring handle, fast with narrow strikes.
1 adjuster.
1 double-hung sash, front.
1 Diamond sash-fast, dull brass.
2 bar sash-lifts, dull brass.
1 jimmy-proof ventilating sash-stop.
1 double-hung sash, rear.
1 Diamond sash-fast, Bower Barff.
2 bar lifts.
1 jimmy-proof ventilating sash stop.
1 book-case, living room; 1 pair 1⅛ doors; 2 single 1⅛ doors.
7 pair butts, 2½ by 2.
1 elbow catch.
1 cabinet lock, ⅝-inch backset, right-hand for double door.
2 cabinet locks, ¾-inch backset, ½ right, for single glass door.
2 cabinet locks, 1¼-inch backset, ½ right, for panel door.
5 key-plates.
5 knobs for doors.
8 drawer-knobs for small drawers.
4 drop-handles for large drawers.
1 buffet, dining room; hardware similar to that for book-case above.
Cases, butler's pantry.
Butts, 3 by 3, on bin, hinged at bottom.
Butts on doors, 2½ by 2, Bower-Barff finish.
Elbow catches, japanned.
Cupboard turns, Bower-Barff finish.
3-foot pieces Stanley rail, ¾-inch.
Sheaves, No. 110 and screws on sliding doors.
Flush lifts, on sliding doors.
Drawer-pulls, on drawers and bin.
1 icing door on rear porch.
1 pair galv. butts, 3½ by 3½, galv. screws.
1 flat-key night latch, reverse latch-bolt.
1 door-pull.

Second Floor.

Dull brass in hall and chambers; nickel in bath; Bower-Barff in servants' part.
1 1¾-inch door, front hall to servants' hall.
1 pair steel butts, 4 by 4, Bower-Barff finish.
1 set thumb-bolt lock, Bower-Barff knob and escutcheon, rear; octagon glass knob and thumb-knob in front hall.
1 1¾-inch door, hall to bath.
1 pair butts, 4 by 4, nickel-plated.
1 set thumb-bolt lock octagon glass knobs; thumb-knob inside, key-plate outside.
Note: Thumb-knob spindle cut off to half the thickness of door, and the plug key is an emergency key from outside.
1 1¾-inch door, hall to chamber.
1 pair butts, 4 by 4, dull brass finish.
1 set thumb-bolt lock, octagon glass knob, thumb-knob inside; key-plate on outside.
1 1⅜-inch closet door.
1 pair butts, 4 by 4, dull brass finish.
1 set 3-tumbler lock, octagon glass knobs and key-plates.
1 1⅜-inch communicating door between chambers.
1 pair butts, 4 by 4, dull brass.
1 set thumb-bolt lock, octagon glass knobs and thumb-knobs each side of door.
2 1⅜-inch doors from 2 chambers to 1 closet between same.
2 pair butts, 4 by 4, dull brass.
2 sets thumb-bolt locks, octagon glass knob and thumb-knob one side of door.
Note: Put thumb-knob on chamber side of door.
2 1⅜-inch doors from 2 chambers to closet having wash-bowl in same.
Use same hardware as above.
1 1⅜-inch door to wash-bowl closet.
1 pair butts, 4 by 4, dull brass finish.
1 set mortise latch, octagon glass knob with closet spindle inside.
1 1⅜-inch mirror door to wardrobe, 3-inch stile.
1 pair butts, 4 by 4, dull brass finish.
1 set mortise latch, 1½-inch backset, knob as above.
1 1⅜-inch door, servants' part.
Same trimmings as kitchen.
Windows of all kinds.
No jimmy-proof sash-stops except over roofs.
1 single sliding communicating door, chamber to bath.
1 door-pull.
1 cup escutcheon, nickel; no keyhole.
1 cup escutcheon, dull brass; no keyhole.
1 Corbin ventilating bolt, nickel finish, No. 1408.
1 Corbin ventilating bolt, dull brass finish, No. 1408.
Put these bolts in the side of the near stile, and the plate on the sliding door stop.
1 wardrobe in chamber; 1 pair 1⅛-inch doors; drawer below.
3 pair butts, 3 by 3½, dull brass.
1 elbow catch at top.
1 bolt at bottom, 3-inch.
1 half-mortise cupboard latch; 1-inch backset and thumb-knob.
2 drawer handles.
1 medicine case.
1 pair butts, 2½ by 2, nickel.
1 half-mortise cupboard latch; 1-inch backset and thumb-knob.
1 linen case, having drop fronts and 36-inch drawers.
Butts, 2½ by 2, dull brass finish.
Forge catches and screws, No. 11, two to each drop.
Drawer knobs, 1⅛-inch, one to each drop.
Stanley desk slides, No. 430, 7½-inch, one to each drop.
Drawer handles, two to each drawer.
1 1⅜-inch secret panel door.
1 pair Soss hinges.
1 mortise latch in the jamb, no knob is required.
1 electric opener No. 151 in the door.
1 push-out spring No. 79 in door.
1 Mite push-button No. 63, located in some hidden place.
If secret door extends down to the floor and the base board is attached to the door, Soss hinges cannot be used. Use No. 53 Sargent sash-center; place it on the inside of the door about 3 inches from hinge edge.
Miscellaneous.
Base-knobs.
Floor door-stops.
Window and sliding door-stop screws and washers.
Coat and hat hooks.

Weight of Wire Nails Needed per 1,000 Feet of Lumber.

Weight of Wire Nails Needed per 1,000 Feet of Lumber

Kind of Material		Distance Apart of Joist, or Studding Nailing Space in Inches	Number of Nails to Each Board each Nailing Space	Size of Nail	Pounds of Nails	Size of Nail	Pounds of Nails
	1x4	12	2	8d com.	57	10d com.	84
	1x4	16	2	8d com.	43	10d com.	65
	1x4	24	2	8d com.	30	10d com.	45
	1x6	12	2	8d com.	38	10d com.	56
	1x6	16	2	8d com.	29	10d com.	43
	1x6	24	2	8d com.	20	10d com.	30
	1x8	12	2	8d com.	28	10d com.	42
	1x8	16	2	8d com.	22	10d com.	32
	1x8	24	2	8d com.	15	10d com.	23
	1x10	12	2	8d com.	23	10d com.	34
	1x10	16	2	8d com.	17	10d com.	26
	1x10	12	3	8d com.	34	10d com.	51
	1x10	16	3	8d com.	26	10d com.	39
	1x10	24	3	8d com.	18	10d com.	27
	1x12	16	3	8d com.	22	10d com.	32
	1x12	24	3	8d com.	15	10d com.	23
	2x6	16	2	20d com.	54	30d com.	75
	2x6	24	2	20d com.	37	30d com.	53
	2x8	24	2	20d com.	28	30d com.	40
	2x10	24	3	20d com.	34	30d com.	48
	2x12	24	3	20d com.	28	30d com.	40
	3x6	24	2	40d com.	45	60d com.	70
	3x8	24	2	40d com.	34	60d com.	52
	3x10	24	3	40d com.	41	60d com.	63
	3x12	24	3	40d com.	35	60d com.	54
Shiplap,	1x8	12	2	8d com.	32	10d com.	47
Shiplap,	1x8	16	2	8d com.	25	10d com.	36
Shiplap,	1x8	24	2	8d com.	17	10d com.	26
Shiplap,	1x10	12	2	8d com.	25	10d com.	37
Shiplap,	1x10	16	2	8d com.	19	10d com.	29
Shiplap,	1x10	24	2	8d com.	13	10d com.	20
Shiplap,	1x10	12	3	8d com.	37	10d com.	56
Shiplap,	1x10	16	3	8d com.	29	10d com.	43
Shiplap,	1x10	24	3	8d com.	20	10d com.	30
Shiplap,	1x12	12	3	8d com.	30	10d com.	45
Shiplap,	1x12	16	3	8d com.	24	10d com.	35
Shiplap,	1x12	24	3	8d com.	16	10d com.	25
Flooring,	⅜x2½	12	1	4d fin.	9	5d fin.	13
Flooring,	1x3	12	1	6d flg.	16	8d flg.	27
Flooring,	1x3	16	1	6d flg.	12	8d flg.	21
Flooring,	1x3	12	1	6d com.	28	8d com.	50
Flooring,	1x3	16	1	6d com.	21	8d com.	39
Flooring,	1x4	12	1	6d flg.	11	8d flg.	19
Flooring,	1x4	16	1	6d flg.	9	8d flg.	15
Flooring,	1x4	12	1	6d com.	19	8d com.	35
Flooring,	1x4	16	1	6d com.	15	8d com.	27
Flooring,	1x6	12	1	6d com.	12	8d com.	23
Flooring,	1x6	16	1	6d com.	10	8d com.	18
Flooring,	1x6	24	1	6d com.	7	8d com.	12
Flooring,	1x6	12	2	6d com.	24	8d com.	46
Flooring,	1x6	16	2	6d com.	20	8d com.	36
Flooring,	1x6	24	2	6d com.	14	8d com.	24
Flooring,	1x8	12	2	8d com.	32	10d com.	47
Flooring,	1x8	16	2	8d com.	25	10d com.	36
Flooring,	1x8	24	2	8d com.	17	10d com.	26
Ceiling,	⅜x4	24	1	5d fin.	4	6d fin.	6
Ceiling,	⅜x6	24	1	5d fin.	3	6d fin.	4
Ceiling,	⅝x4	24	1	6d fin.	6	8d fin.	10
Ceiling,	⅝x6	24	1	6d fin.	4	8d fin.	6
Ceiling,	⅞x6	24	1	6d com.	7	8d com.	12
Siding,	½x4	16	1	6d com.	15	8d fin.	15
Siding,	½x6	16	1	6d com.	10	8d fin.	10
Siding,	½x4	16	1	6d fin.	9	7d fin.	10
Siding,	½x6	16	1	6d fin.	6	7d fin.	7

Estimating Quantities of Nails.

The table will give the number of wire nails in pounds for various kinds of lumber, per thousand feet board measure, allowance being made for loss of covering surface due to lap or matching of material. The sizes given are as rated on the market.

If cut nails are used, add ⅓ to the number of nails as shown in the table.

The table is based on the use of lumber cut to an average length of 12 feet, except in the case of ⅜-inch flooring, which is based on an average length of 6 feet.

Shingles, per 1,000, require 3½ pounds of 3d, or 5 pounds of 4d nails.

Lath, ordinary, per 1,000, studding spaced 12-inch centers, 10 pounds of 3d common wire nails. Studding spaced 16-inch centers, 8 pounds of 3d common wire nails.

Bridging, per set for 2x10 joists spaced 16-inch centers and 8 nails per set, will require 26 pounds of 8d common, or 38 pounds of 10d common wire nails per 1,000 linear feet of bridging.

Furring, 1x2, will require 10 pounds of 10d nails, or 7 pounds of 8d nails, per 1,000 feet of length.

Framing studding will require 15 pounds of 10d, and 5 pounds of 20d nails, per 1,000 feet of studding.

Framing joists will require approximately the following amounts of 20d nails per 1,000 feet:

	Lbs.
Frame buildings, 16-inch centers	15
Frame buildings, 12-inch centers	20
Brick buildings, 16-inch centers	10
Brick buildings, 12-inch centers	12

Finish ⅞-inch, will require about 20 pounds of 8d finish nails per 1,000 feet, while 1¼-inch will require 30 pounds of 10d finish nails per 1,000 feet.

Clapboards will require about 18 pounds of 6d box nails per 1,000 feet.

FIGURING GLASS

Sometimes the carpenter and sometimes the painter is to do the glazing. The specification ought to state this clearly unless the job is a small one.

Plate glass is the highest grade of window glass. It is cast in large sheets on a flat table, and then polished. This glass is manufactured in sheets of different sizes, some as large as 12 feet wide by 16 feet long. The average thickness of plate glass is from ¼ to 5/16 inch. Large plates are made ½-inch thick.

Sheet glass, or common window glass, is so named on account of the method of manufacture. The glass is first blown in the form of a cylinder, then cut along the side of the cylinder and flattened on a stone. This method of manufacture causes a wavy appearance in the product, which readily distinguishes it from plate glass.

Grades of Window Glass. Window glass is made in three different grades, in both single strength and double strength, the grading of the glass depending upon its color and brilliancy, and the presence or absence of flaws in the material. The best quality is rated as AA, the second as A, and the third as B. The AA grade is supposed to be of very fine quality and free from flaws, while the A grade is the one commonly used. B grade glass is used in cellar windows, factories, greenhouses, or other places where the quality of the glass is not important.

Stock Sizes of Window Glass. The regular stock sizes of window glass vary in width, by inches, from 6 to 16 inches, and then, by increases of 2 inches, up to 60 inches. The length or heighth of these sizes varies from 8 inches up to 90 inches in the different sizes of single- and double-strength glass. The exact size of glass may be obtained from a list of standard sizes and prices of same, which may be obtained from any jobber.

The thickness of ordinary window glass is about 1/16 inch for single-thick or single-strength glass, but double-thick or double-strength glass is nearly ⅛-inch thick.

Mode of Setting. Ordinary window glass is held in place by means of small triangular pieces of thin tin or zinc which measure about ¼-inch on a side, and finally by a strip of putty. The tin points hold the glass in place until the putty has hardened. Large lights of glass require more points than small ones, but a good rule is to space the points about 6 inches apart.

The amount of putty required for a given job may be estimated approximately on the basis of 1 pound of putty for each 25 linear feet around edge of glass.

The number of points needed may be determined from the rule given above, knowing the number of linear feet of edge of glass.

Method Selling Glass. Window glass is sold by the box containing about 50 square feet of glass. The number of panes per box will depend upon the size of the pane.

If it is desired to find the number of boxes of window glass of a given size necessary for a job, divide 50 multiplied by 144, by the result obtained by multiplying the width of the pane by its length. This will give the number of panes of glass per box. The total number of panes needed, divided by the number of panes per box, will give the number of boxes to be ordered.

For example, suppose that it is desired to find how many boxes of glass would be needed to furnish glass for 12 windows consisting of 4 panes of glass, each 13 by 28 inches:

$$\frac{50 \times 144}{13 \times 28} = 20 \text{ (nearly).}$$

Thus it is seen that 1 box of glass contains 20 panes. If 48 panes are needed, 3 boxes of glass would have to be ordered, or 2 boxes and 8 extra panes. If 3 boxes were ordered, there would be a liberal allowance for breakage, and there would be some left over. If exactly enough glass was ordered to fill the job, there would be danger of a shortage due to breakage.

CHAPTER XXXV.

CHECKING LIST

In the list which follows the items are given. Your estimate book or blanks should have columns showing the material and also the labor "costs" for each item. This list will be found convenient and if you check your estimate therewith, you will minimize the possibility of making a mistake.

Excavation.
For Outbuildings.
For Walk.
For Driveway.
For Curbing.
For Incline to Basement.
For Septic Tank.
For Fence Posts.
Wood Piling.
Concrete Piling.
Sheet Piling.
Shoring.
Pumping.
Drilling.
Blasting.
Removing Rock.
Bracing.
Hauling.
Re-filling.
Grading.
Drainage for Buildings.
Drainage of Grounds.
Teams, Scrapers, etc.
Miscellaneous.
Total.

Concrete Work.
Footings.
Foundation Walls.
Retaining Walls.
Elevator Pit.
Machinery Foundations.
Foundations for Heating Plant.
Cellar Partitions.
Piers.
Cistern.
Steps.
Areas and Hatchways.
Water Table.
Floors.
Base.
Beams.
Girders.
Columns.
Lintels.
Sills.
Chimneys.
Copings.
Chimney Breasts.
Hearth.
Fireplace.
Chimney Tops.
Stucco.
Granolithic Work.
Terrazzo Work.
Composition Floors.
Waterproofing.
Cleaning Work.
Finishing Work.
Wood Forms.
Steel Forms.
Placing Forms.
Greasing Forms.
Taking Away Forms.
Braces for Forms.
Cleaning Forms.
Ties for Forms.
Reinforcement.
Concrete Block Work.
Concrete Brick Work.
Concrete Drain Tile.
Anchors.
Wall or Ceiling Sockets.
Metal Wall Ties.
Wall Plugs.
Sidewalks.
Driveways.
Paving.
Curbing and Gutters.
Hitching Block.
Fence Posts.
Protection of Work.
Total.

Stone Work.
Footings.
Foundations.
Retaining Walls.
Elevator Pit.
Buttresses.
Areas and Hatchways.
Cellar Partitions.
Piers.
Foundations for Heating Plant.
Cistern, Dry Well, Cesspool.
Posts.
Stone Flagging.
Water Table.
Sills.
Steps.
Belt Courses.
Key Stones.
Stone Trimmings.
Arches.
Cornices.
Columns.
Copings.
Base.
Chimney Breasts.
Lintels.
Chimneys, Fireplaces.
Wheel Guards.
Walks.
Rubble Work.
Rough Dimension Work.
Plain Ashlar Work.
Tooled Ashlar Work.
Rock-Face Ashlar.
Mortar.
Staging.
Concrete for Mason.
Damp-proof Painting.
Waterproofing.
Pointing.
Cleaning Work.
Wall Ties.
Anchors.
Wall Plugs.
Derricks and Supplies.
Curbing.
Total.

Brickwork.
Common Brickwork.
Face Brickwork.
Enameled Brickwork.
Retaining Walls.
Elevator Pit.
Brick Arches.
Floor Arches.
Floors.
Cellar Partitions.
Areas and Hatchways.
Piers.
Foundation for Heating Plant.
Cistern.
Chimneys.
Fireplace.
Hearth.
Lining Flues.
Fire Brick.
Chimney Breasts.
Cork Brick.
Mortar.
Staging.
Centers for Mason.
Anchors.
Wall Ties.
Wall Plugs.
Pointing.
Cleaning Work.
Walks.
Paving.
Total.

Terra-Cotta and Tiling.
Tile Floors.
Interior Tile Work.
Trimmings.
Structural Tile Walls.
Structural Tile Floors.
Imitation Tile Work.
Ornamental Work.

Glazed Terra-Cotta Work.
Hearth.
Fireplace.
Marble Wainscoting.
Marble Floors.
Mosaic Floors.
Bolts and Ties.
Reinforcement.
Mortar.
Scaffolding.
Miscellaneous.
Total.

Framing.

Outside Walls.
Floors.
Girders—Posts.
Sills.
Studding.
Joists.
Posts, Girts and Braces.
Ribbon Board.
Collar Beams.
Partitions.
Plates.
Roof.
Trusses.
Areas and Cellar Hatchways.
Bridging.
Cellar Partitions.
Porches.
Bay Windows.
Dormer Windows.
Towers.
Cupolas.
Laying Under-Floors.
Steps.
Stairs.
Outbuildings.
Total.

Sheathing and Siding.

Sheathing Outside Walls.
Sheathing Roof.
Siding Walls.
Siding Gables.
Siding Dormers.
Towers and Cupolas.
Dimension Shingle Work.
Porches.
Bay Windows.
Cornice.
Half-Timber Work.
Waterproof Paper.
Ornamental Shingling.
Mouldings (See Exterior Trim).
Outbuildings.
Miscellaneous.
Total.

Roof Covering.

Wood Shingles.
Metal Shingles.
Ornamental Strip Shingles.
Asphalt Shingles.
Asbestos Shingles.
Tar and Gravel.
Canvas Roofing.
Ready Roll Roofing.
Tin Roofing.
Concrete Roofing.
Galvanized Iron Roofing.
Canvas Roofing.
Copper Roofing.
Slate Roofing.
Tile Roofing.
Insulation.
Waterproof Paper.
Roof Flashings (See Sheet-Metal Work).
Valleys (See Sheet-Metal Work).
Wood Skylights.
Scuttles.
Total.

Exterior Trim.

Water Table.
Door Frames
Window Frames.
Exterior Window and Door Finish.
Corner Boards.
Porch Trim.
Porch Hand and Foot Rails.
Porch Balusters.
Porch Ceilings.
Steps.
Belts.
Balustrades.
Cornice Work.
Eaves.
Frieze.
Outside Blinds.
Lattice Work.
Pedestals or Newels.
Columns (Wood).
Gable Ornaments (Wood).
Wood Gutters.
Ornamental Ridging.
Mouldings.
Miscellaneous Outside Finish.
Total.

Interior Trim.

Doors.
Door Trim.
Thresholds.
Sliding Doors.
Double Swinging Doors.
Windows.
Window Trim.
Transoms.
Weather Strips.
Inside Blinds.
Hardwood Floors.
Parquet Floors.
Ordinary Floors.
Deadening Floors and Partitions.
Finishing Floors.
Venetian Blinds.
Panel Work.
Wainscot.
Base.
Picture Mould.
Mouldings.
Chair Rail.
Plate Rail.
Wood Corners.
Cornice.
Beam Ceiling.
Stair Work.
Balustrades.
Newel Posts.
Grillwork (Wood).
Mantels.
Fireplaces.
Window Seats.
Sideboards.
Book Cases.
Colonnades.
Medicine Closets.
Linen Closets.
China Closets.
Clothes Closets.
Butler's Pantry.
Pantry.
Shelving.
Drawers.
Cupboards.
Clothes Rails.
Wardrobes.
Sink Frames.
Drain Boards.
Tub Covers.
Mirrors.
Scaffolding.
Special Inside Finish.
Total.

Sheet Metal Work.

Cresting.
Finials.
Ridge Caps.
Hip Caps.
Scuttles.
Skylights.
Ventilators.
Ventilation Flues.
Cornices.
Gutters.
Conductors.
Conductor Straps or Irons.
Conductor Heads.
Flashings.
Valleys.
Vanes.
Copings.
Mouldings.
Belts.
Metal Corner Beads.
Metal Ceilings.
Borders and Friezes.
Siding.
Girder Coverings.
Corner Caps.
Furring.
Blocks.
Galvanized Iron Work.
Soldering, Acid, etc.
Scaffolding.
Miscellaneous.
Total.

Steel and Iron Work.

Anchors.
Angles.
Balconies.
Balusters.
Brackets.
Built-Up Members.
Casings.
Channels.
Chimney Caps.
Clean-Out Doors.
Coal Chutes.
Columns.
Column Bases.
Column Caps.
Connections, Bolts, etc.
Cornices.
Door-Frames.
Elevator Enclosure.
Fascias.
Fencing.
Fireplace Fronts.
Fireplace Traps.
Fire Escapes.
Floor Plates.
Gates.
Grills.
Handling and Erecting.
Joist Hangers.
Lintels.
Manhole Plates and Covers.
Ornamental Iron Work.
Painting Steel and Iron Work.
Partition Studs.
Railings.
Sash Weights.
Scaffolding.
Separators and Bolts.
Shutters.
Sidewalk Gratings.
Stable Fittings.
Stable Partitions.
Stairs.
Steel Beams.
Steel Plates.
Thresholds.
Truss Chairs.
Turnbuckles.
Vault Doors.
Veranda Supports.
Wall-Plates.
Wheel Guards.
Window Guards.
Total.

Plastering.

Wall Furring.
Beam Furring.
Ceiling Furring.
Cornice Furring.
Grounds.
Wood Lathing.
Metal Lathing.
Nails and Staples.
Lime Plaster Work.
Cement Plaster Work.
Hard Wall Plaster Work.
Plaster Board and Wall Board Work.
Asbestos Plaster Work.
Plaster of Paris Work.
On Masonry.
On Brickwork.
On Concrete.
Colored Mortar.
Ornamental Plaster.
Scaffolding.
Protection of Work.
Total.

Painting and Decorating.

Preparing Work.

Priming.
Exterior Work.
Interior Work.
Wood Filling.
Hardwood Finishing.
Varnishing.
Waxing.
Staining.
Bronzing.
Shellacking.
Enameling.
Floor Finishing.
Oiling.
Plaster Wall Painting.
Sizing Walls.
Tinting Walls or Calcimining.
Oil Painting on Walls.
Dipping Shingles.
Paperhanging.
Stencil Work.
Special Work.
Painting Outbuildings.
Painting Fences.
Total.

Plumbing.

Roughing In.
Back Boards.
Bathtubs.
Bathroom Fixtures.
Brass Work.
Catch-Basin, Cesspool, Dry Wells, Septic Tank.
Ceiling Plates.
Cellar Drainers.
Cistern Sink Pump.
Drain-Boards.
Faucets.
Flanges.
Floor Plates.
Grease Trap.
Laundry Tubs.
Lavatories.
Lead Work.
Manhole Covers (See Steel and Iron).
Piping and Fittings.
Pipe Holders and Supports.
Pneumatic Water Supply Outfit.
Range Boiler and Stand.
Shower Bath.
Sinks.
Soil Pipes.
Solder, Lead, etc.
Traps.
Urinals.
Valves.
Vents.
Vent Stack.
Water Back for Range.
Water-Closets.
Water Meter.
Water Supply.
Well Pump.
Breakage.
Testing.
Total.

Hardware.

Basement Door Trim.
Bolts.
Blind Hinges.
Brackets.
Casement Window Hardware.
Chain Bolts.
Coat and Hat Hooks.
Cupboard Catches.
Door Bell.
Door Bolts.
Door Checks.
Door Holders.
Door Knobs.
Door Locks.
Door Plates.
Door Stops.
Double-Action Hinges.
Drawer-Pulls.
Escutcheons.
Hinges.
House Numbers.
Latches.
Letter-Box.
Nails.
Putting on Hardware.
Push Buttons.
Sash-Cord.
Sash Hinges.
Sash Lifts.
Sash Locks.
Shelving Brackets.
Sliding Door Hangers.
Sliding Door Hardware.
Sliding Door Tracks.
Speaking Tubes.
Staples.
Store Door Locks.
Transom Hardware.
Window Fasteners.
Miscellaneous.
Total.

Lighting and Wiring.

Acetylene Gas Generator.
Acetylene Lighting Fixtures.
Base Plugs.
Boxes.
Cleats.
Conduit.
Cord.
Cut-Out Cabinet.
Electric Bells.
Electric Fixtures.
Electric Generator Set with Engine.
Electric Meters.
Floor Plugs.
Fuse Boxes.
Gas Fixtures.
Gas Meter.
Gas Piping.
Insulators.
Knobs, Tubes, etc.
Rosettes.
Sockets.
Special Accessories.
Switches.
Switchboards.
Wiring.
Wood Moulding.
Miscellaneous Electrical Supplies.
Total.

Heating.

Hot-Air Plant.
Steam Plant.
Hot-Water Plant.
Registers and Frames.
Heater Pipes.
Cold-Air Ducts.
Piping and Fittings.
Radiators.
Valves.
Covering Pipes.
Bronzing Radiators.
Range.
Laundry Stove.
Gas Water Heater.
Smoke Pipes.
Thermostat.
Dampers.
Automatic Regulators.
Clean-Out Doors.
Firing Tools.
Testing Plant.
Miscellaneous Fittings.
Total.

Miscellaneous Fixtures and Equipment.

Awnings.
Awning Supports.
Board Walks.
Canopies.
Cellar Store Closets.
Clothes Chute.
Clothes Line Posts.
Clothes Lockers.
Clothes Reel.
Coal Bin.
Door Screens.
Dumb Waiters.
Elevator.
Elevator Enclosures.
Fences.
Fire Escapes.
Fireproof Doors and Windows.
Fireproof Shutters.
Flour Bin.
Gates.
Garbage Receptacle.
Hitching Posts.
Office Fixtures.
Pergola.
Shades.
Storm Doors.
Storm Sash.
Store Equipment and Fixtures.
Vacuum Cleaner.
Vault.
Window-Screens.
Total.

Outbuildings.

Barns.
Coal Sheds.
Cyclone Cellar.
Dog Kennel.
Feeding Floor.
Garage.
Hog House.
Milk House.
Poultry House.
Root Cellar.
Sheds.
Silos.
Stables.
Stable Fixtures (Wood).
Stock Watering Tank.
Windmill.
Total.

General Expenses.

Board.
Bond.
Cartage of Materials.
Cleaning Out Building.
Depreciation of Plant.
Engineering Expenses.
Fences and Protection.
Fire Insurance.
Freight on Materials.
Interest on Investment in Plant.
Liability Insurance.
Permits.
Protection of Work.
Protection of Other Property.
Protection of Streets and Sidewalks.
Sheds and Temporary Outbuildings.
Staging and Scaffolding.
Storage Bins.
Storage of Supplies and Materials.
Telephone.
Temporary Closet and Heating of Building.
Temporary Doors and Windows.
Temporary Lights.
Temporary Office.
Timekeeper.
Water for Building Use.
Watchman.
Waste of Materials.
Miscellaneous.
Total.

Summary of Estimate.

Preliminary Work.
Excavation.
Concrete Work.
Stone Work.
Brickwork.
Terra-Cotta and Tiling.
Framing.
Sheathing and Siding.
Roof Covering.
Exterior Trim.
Interior Trim.
Sheet-Metal Work.
Steel and Iron Work.
Plastering.
Painting and Decorating.
Plumbing.
Hardware.
Lighting and Wiring.
Heating.
Misc. Fixtures and Equipment.
Grading and Sodding.
Outbuildings.
General Expense.
Total.

IDEAS FOR HOME BUILDERS

CHAPTER XXXVI—HOME BUILDING BY THE WHOLESALE

Economy Both for Builder and Owner in Construction by the Dozen—Narrow-Lot House Designs Featured.

Builders often have the opportunity to build up a certain section of a city or town. Such a proposition presents many possibilities to the up-to-date contractor. The best equipment will pay on such a job as it can be kept right on the job and will not have to be carried around. For instance, a power woodworker would pay for itself several times over because of the fact that its usefulness would be increased very largely by the fact that it would not have to be moved very much and could be kept working all the time.

Building up sections happens in different ways in different localities. In the smaller town, certain blocks may be finished up or one side of a block may be built up with two or three houses such as are shown in groups in the accompanying illustrations.

Probably the most common way in which sections are built up is along improved streets. The sidewalks are laid and the owner of the frontage on the improved street decides to build up the entire frontage at one time.

In the city a builder will often have all the work to do in building up part of a sub-division and may have several different groups of houses to build which face on different streets. The amount of profit that the contractor or builder makes on this sort of work will depend entirely on the organization that he can develop and the use of all the labor saving devices that are available.

Such work as this makes it possible for a builder to buy apparatus that he has wanted but has felt that he couldn't afford; because it will pay for itself on the work. The busier you can keep a machine and the less it has to be moved over long distances, the sooner the saving will more than balance the cost.

There are two things to guard against in the design of groups of houses such as are shown here. They must not look so much alike as to become monotonous; on the other hand they should not contrast so sharply that some of the houses

Attractive side entrance for cement stucco house. Good architectural details such as this make property more salable.

Unusual two-story porch for colonial house. A distinctive way of building a side entrance.

Perspective view of designs No. 6773 and No. 6774. Both houses are finished in cement stucco trimmed with dark stained woodwork. Plans and specifications for either of these designs can be furnished for $8.00 per set. No. 6773 has four rooms on the second floor and three on the first, and No. 6774 has three on each floor. A feature of each design is the large living room with the adjoining porch.

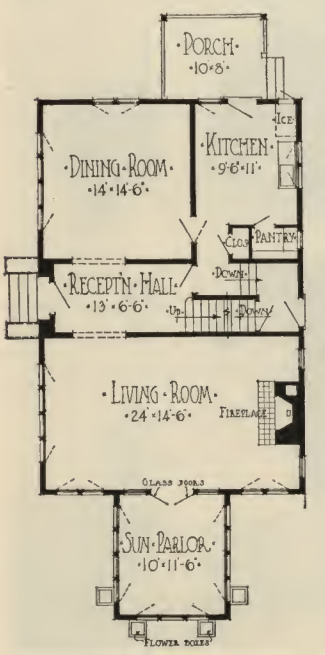
look insignificant or that the combination seems to lack harmony. All the designs must fit into the general scheme and each one must present an attractive appearance both by itself and in combination with the neighboring houses.

It's an entirely different problem to build one house for someone following his own and your suggestion than to buid a group with the object of selling each house in the group. In the first case the owner may have certain radical features that he wishes to incorporate in his house, and as long as he is the one to be pleased these ideas are considered. In the group houses the designs must all be more or less conservative as the taste of the prospective owner is absolutely unknown. The problem therefore is to provide a house that is distinctive and yet contains no freakish special features that are likely to impress prospects in the wrong way.

This idea applies equally well to both the exterior treatment and the room arrangement. The designs shown here are handled in this way, and each group is harmonious and contains no radical features that are likely to cause disapproval. Yet each house is distinctive and attractive.

The floor plans of each of the houses are somewhat similar because this particular arrangement has been found to be the most practical. The arrangements differ of course in various little things, but in a general way they are much the same.

The opportunity for harmonious contrast lies almost altogether in the exterior treatment, and this is where these houses differ from each other.



First floor plan.

Second floor plan.

Arrangement of rooms in design No. 6773. Size, 25 feet by 37 feet 6 inches.

First floor plan.

Second floor plan.

Floor arrangement of rooms in design No. 6774. Size, 24 feet by 37 feet.

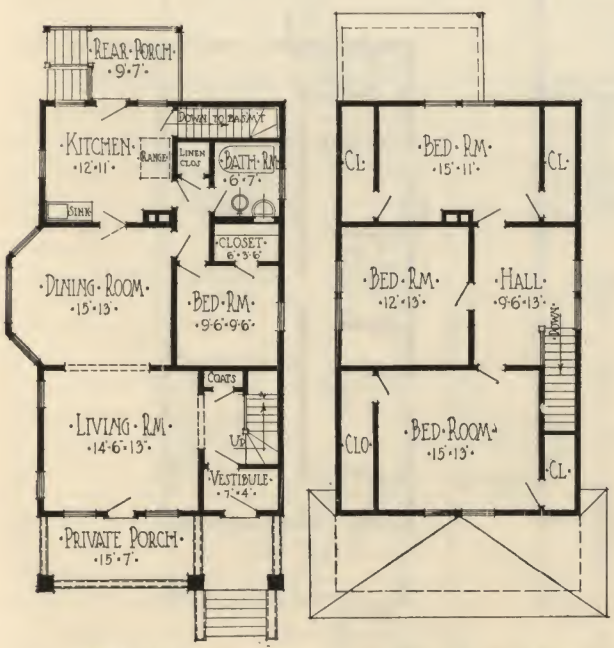
Three frame cottages, designs Nos. 6777, 6776, 6775. The first is two stories and contains seven rooms. The other two are of the bungalow type, one story. The room arrangement in all these houses is very attractive and economical. We can furnish complete details, plans and specifications for any one of these designs for only $5.00 per set.

In arranging for the building of these group houses, the lots are generally made fairly narrow so these designs are made narrow enough to go on a small lot. The widest is 25 feet and the narrowest is 21 feet, which is small enough to go on any lot; as they are seldom made narrower than 25 feet and are generally a little wider than this.

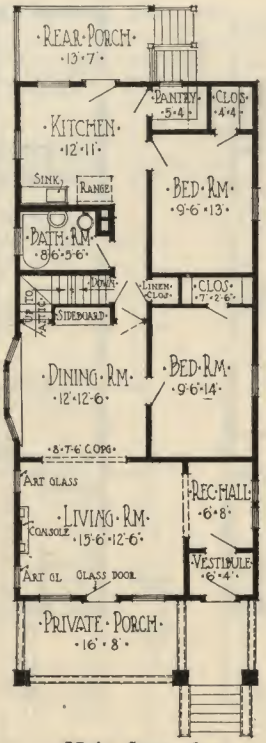
Several factors enter into the selection and arrangement of the rooms. The main object to be accomplished in the design of a small house is the utilization of all the room possible, consistent with convenience and accessibility and also cost. Very often the latter item can be affected by altering the sizes of the rooms a little so as to enable the use of stock lumber. This reduces the amount of cutting that is necessary and thus reduces the cost—often to a marked degree. It also enables the builder to do faster work, which may be an important factor at times.

The three different groups shown in the illustrations are finished in three different ways. The first two, Designs No. 6773 and No. 6774, are both two-story houses and are finished in stucco on metal lath. The exteriors and also the interiors are modeled along the same plan, tho the first contains seven rooms and the other six. Both have an attractive side entrance with a loggia in the front. The loggia can be either left open or glazed-in.

Frame construction is used for Designs Nos. 6777, 6776, and 6775. The first is of two stories, while the other two are of the bungalow type. The foundations of these three and also of the other designs are made of concrete up to the grade line. The walls are of typical 2 by 4 stud construction which is covered with sheathing. The sheathing is then cov-



First floor plan. Second floor plan. Room arrangement in design No. 6777, size 23 feet by 39 feet.



Main floor plan. Design No. 6776, size 23 feet by 49 feet.

Main floor plan. Design No. 6775, size 23 feet by 44 feet 6 inches.

Brick constructed cottages, designs Nos. 6780, 6779, 6778. Rear and side walls are constructed of ordinary brick, while the front is built of face brick. The gambrel roof house to the extreme left has six rooms on the main floor and two more can be finished off above. The other two houses have six and five rooms respectively. Complete plans, details and specifications for any of these designs are only $5.00 per set.

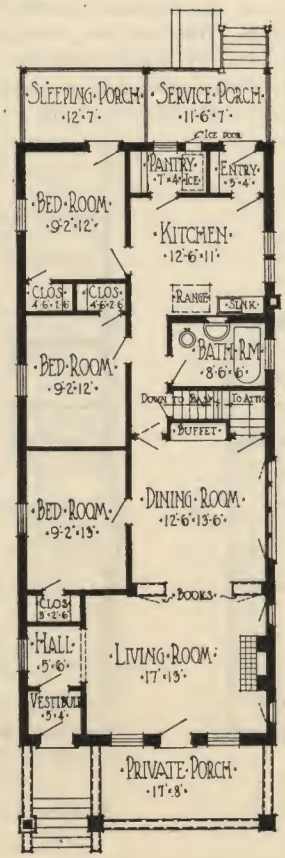
ered with rosin building paper and No. 1 four-inch beveled siding. Floor joists are usually made of 2 by 10's, which are spaced 16 inches on centers. The ceiling joists are also spaced 16 inches on centers and are made of 2 by 6 timbers.

Designs Nos. 6780, 6779, and 6778 are built of brick. The walls on the concrete foundations are nine inches thick on the side and rear, while the front is 13 inches thick, finished with face brick. Two of the houses in this group are of the bungalow type with the flat hip roof, and the other has a gambrel roof. This latter type is preferred by many people because of the space that is made available in the attic. Each house has a brick fireplace in the living room.

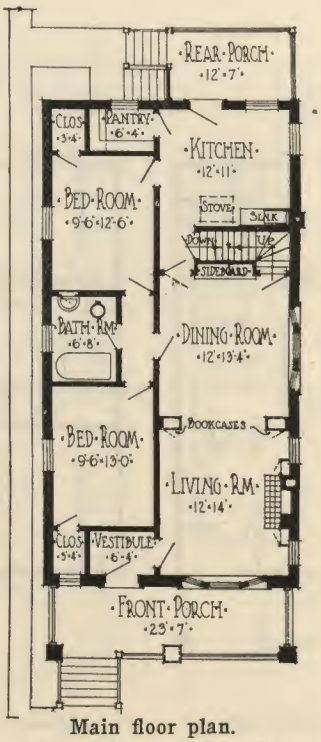
A study of these groups and their floor plans will give the builder many valuable ideas on group arrangement and will also provide much useful information on single houses of several different kinds. Each of the houses is of course separate and will look well if set off by itself away from the rest of the group.

These are narrow-lot designs.

Main floor plan. Design No. 6780, size 21 feet by 48 feet.



Main floor plan. Design No. 6779, size 24 feet by 56 feet.



Main floor plan. Design No. 6778, size 24 feet by 45 feet.

Modern Dutch colonial home of pleasing design. Size, 36 feet by 34 feet. We can furnish complete set of blueprinted working plans and typewritten specifications for only $10.00 per set. Blueprints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections; and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter. When ordering, ask for Design No. 6800.

Handsome Dutch Colonial Residence of Six Rooms

A particular feature of the comfortable, stately home shown in the accompanying illustrations is the size of the living room and its general arrangement. It presents almost an ideal room in a family house such as this one.

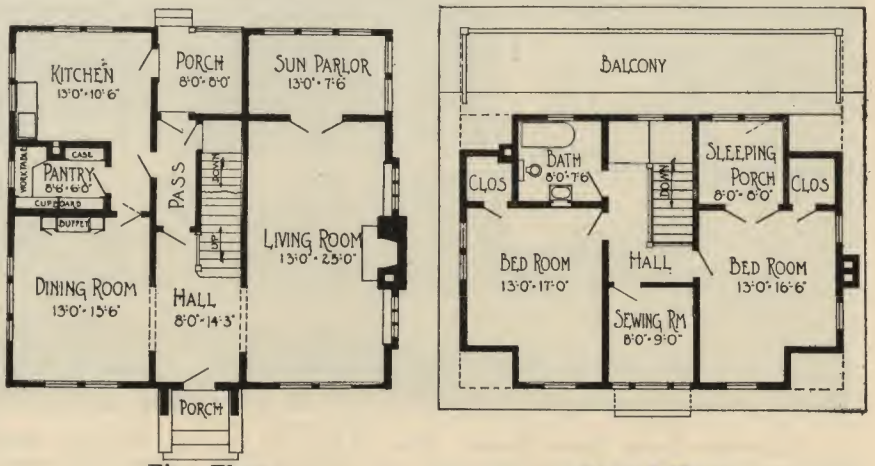
In many living rooms it is necessary to give the effect of length by placing the fireplace in the end. This room, however, is long enough so that it can be arranged to give the impression of compactness. This idea is carried out by placing the large brick fireplace along one of the side walls instead of in the end. Such an arrangement gives plenty of inside wall space so that some well chosen furniture can be secured to fit in with the general scheme. With the double swinging doors into the sun porch open, the floor arrangement gives a large unobstructed space along one side of the house.

The connection to the dining room thru the cased openings on each side of the hall also gives considerable unobstructed space along the front of the house. Many people desire such an arrangement because it makes the house most suitable for entertaining.

The hall from the front porch passes thru the house from front to back and leads to the small back porch. It makes all the rooms readily accessible. The stairs to the second floor are also located in this hall.

The well arranged kitchen is back of the dining room. The convenient serving pantry is a pleasing feature.

The exterior with its gambrel roof, doorway design, and stucco walls is typically Dutch colonial.



First Floor. **Second Floor.**

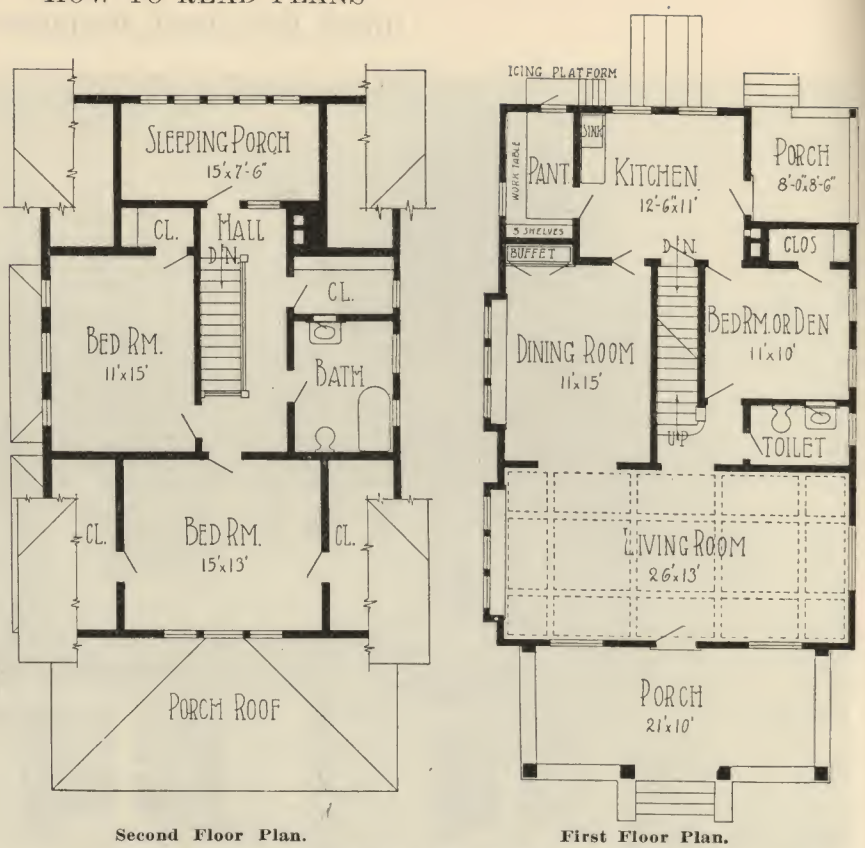
Arrangement of House, Size 36 feet by 34 feet.

Attractive Gambrel Roof House

The exterior design of the seven-room house shown here presents an attractive combination of shingle and beveled siding finish. The shingles are used for the entire upper floor and the porch while the siding furnishes a pleasing balance in the design and brightens the entire house by its effect on the lower portion of the walls. Special features are the distinctive upper sash of the windows above the porch and the wide arches in the porch design.

The living room extends entirely across the width of the house and is finished with exposed timber ceiling construction. A shelf is built into the wall at one end beneath three windows. This room is large and bright, has six windows and is sure to be a pleasant part of the house. Cased openings lead to the stairway and the dining room. The buffet, built with its doors flush with the wall, may be seen from the front door. The dining room is also fitted with three windows having a broad sill similar to that in the living room.

The staircase is attractive and handy with a little hall at the foot. A first floor toilet is provided off this hall.



Second Floor Plan. **First Floor Plan.**

Arrangement of House. Size 27 Feet by 41 Feet.

Home-like Seven-Room House. Size, 27 feet by 41 feet. We can furnish complete set of blueprinted working plans and typewritten specifications for only $10.00 per set. Blueprints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections; and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter. When ordering, ask for Design No. 6840.

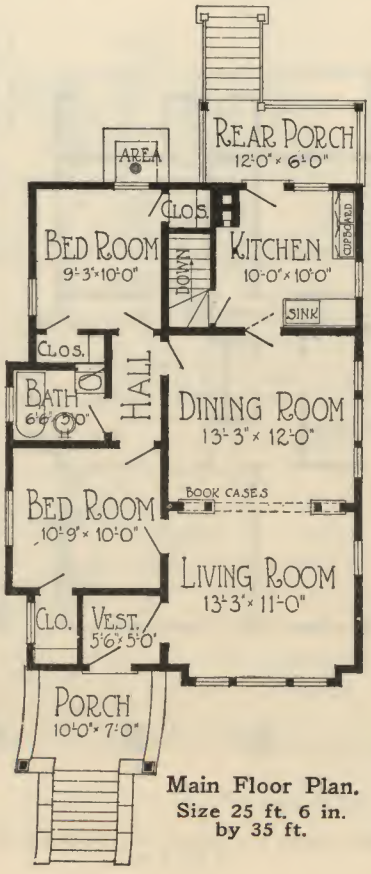
Comfortable Cottage Design of five rooms. We can furnish complete set of blueprinted working plans and typewritten specifications for only $5.00 per set. Blueprints consist of basement plan; roof plan; main floor plan; front, rear, two side elevations; wall sections; and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter. When ordering, ask for Design No. 6727.

Wide-Board High Cottage

A five-room bungalow of quiet, comfortable beauty is shown in these illustrations as Design No. 6727. This cottage is of the type that is built high so as to provide a dry, well lighted basement with considerable headroom. A basement of this style is generally much more useful than the ordinary dark basement. Plenty of room is assured for a heating plant, and there will be space for a laundry and a work bench—which is very desirable.

The exterior is finished with extra wide boarding and white trim. The gable treatment is worth noting. The heavy beam sill placed on two brackets under the small window is unusual. The projecting three window bay at the front is attractively finished.

The entrance from the front porch is into a small vestibule which opens into the well designed living room. The cased opening from this room to the dining room extends almost completely across the room, so the effect given is that of one big room. The space underneath the colonnade on each side is utilized as bookcases. The arrangement of the windows, in this room in connection with the doors and wall spaces, will suggest many ways of decorating the room artistically. By the proper selection of furniture and decorations, it can be made extremely attractive. The finish of the living room and dining room should be made to harmonize.



Main Floor Plan. Size 25 ft. 6 in. by 35 ft.

The dining room is large and is lighted by three wide windows on the side. The furniture in this room should be of a type that will go well with the living room. Doors open from this room to the kitchen and also to the back hall.

The kitchen is of the compact kind; arranged to provide the maximum amount of comfort and convenience. The cupboard is along one side next to the window and the sink is along the wall between it and the dining room. The rear porch is available for keeping many things that may be wanted at various times. The entrance to the basement is thru the kitchen.

There is a back hall in the house which makes all the rooms easy of access. This hall opens into the bedrooms, the bathroom and the dining room. One of the bedrooms also has a door into the living room. The two bedrooms are well arranged with windows and large, roomy closets.

This house will go well on a narrow lot as it is only 25 feet 6 inches wide. Its restful and comfortable character will make it harmonize well with almost any surroundings. It is a type of simple design *that is much sought after.*

Pleasant Cottage Home

The bungalow shown here is an excellent type of home for the family that takes pride in making the various rooms of the house in which they live as cozy and attractive as possible. Of course, for such a family the house must, in itself, have the qualities of coziness and attractiveness or no amount of labor will seem to produce just the effect that is desired. The bungalow seems to be the right type, and this particular design has many desirable features from this standpoint.

The walls of the bungalow are plastered white or some light shade of gray. Wood trim is finished dark in contrast to the light walls. A hip roof is used with small dormers having their sides finished with shingles. Brick chimneys are used for the fireplace, furnace and kitchen stove. The porch is very attractive and useful. It is built across the front of the house and extended on one end so that steps along the side of the house make it accessible from the rear. The end of the porch near these steps is built in the pergola style. The general exterior design is simple but very attractive.

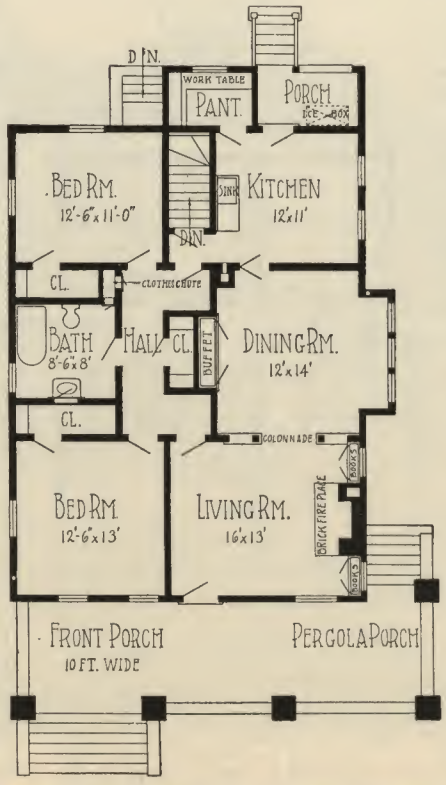
With very little effort the rooms of this bungalow may be made exceptionally cozy and home-like. The living room and dining room are joined together with only a colonnade between. These rooms should be finished in somewhat the same style to produce the best effect. the large fireplace with bookcases on each side may be made the center of attraction in the living room. The dining room is well arranged, having a buffet built into the wall opposite the three-window bay.

A double-acting door leads from the dining room into the kitchen. The value of the arrangement of this part of the house will be appreciated by every housewife. At the rear of the kitchen are the pantry and the rear porch. Both of these may be used to very good advantage in connection with the kitchen. The pantry is fitted with shelves and a work table. A large window furnishes an abundance of light. The refrigerator may be placed on the rear porch and, since it is open on one side only, a great many uses may be found for this porch during the season when the temperature will permit its use.

There are two bed rooms each having a large closet, one at the front of the house and the other at the rear. A hall connects all rooms with the exception of the dining room. There is a closet in the hall which furnishes a handy place in which to keep extra bed clothes. The bath is roomy and well equipped. A special feature in this part of the house is the clothes chute into which openings are made in both the hall and the bath room.

The basement is entered from a nook off the kitchen. It may be made a very useful part of the house. Rooms should be divided off to provide for the furnace, coal bins, vegetable storage and laundry. The location of the laundry is preferably under the rear bed room since the clothes chute should terminate in this room. The floor of the entire basement should be of concrete which is also an excellent material for the foundation walls. If the entire substructure of the house is made of poured concrete it is certain that the basement will be dry and easy to keep clean.

Well arranged bungalow of five rooms. Size, 30 feet by 40 feet. We can furnish complete set of blueprinted working plans and typewritten specifications for only $7.00 per set. Blueprints consist of basement plan; roof plan; main floor plan; front, rear, two side elevations; wall sections; and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter. When ordering, ask for Design No. 6843.



Floor Plan of Bungalow. Size 30 Feet by 40 Feet.

Ventilated attic bungalow of five rooms. Size, 34 x 35 feet. We can furnish complete set of blueprinted working plans and typewritten specifications for only $5.00 per set. Blueprints consist of basement plan; roof plan; main floor plan; front, rear, two side elevations; wall sections, and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter. When ordering, ask for Design No. 6708.

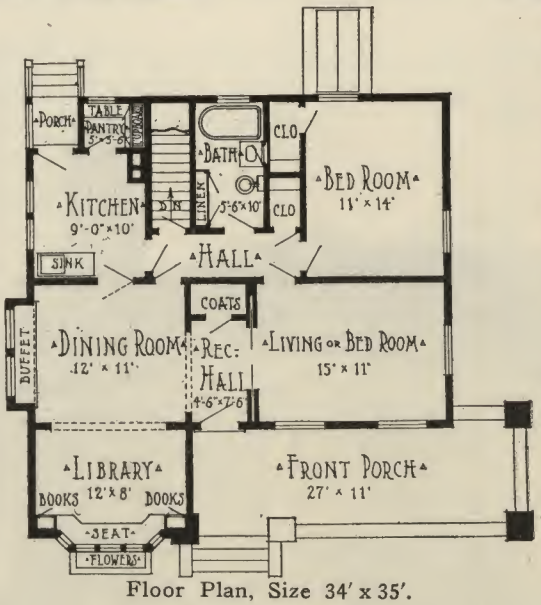
Bungalow with Ventilated Attic

A beautiful and distinctive home of the bungalow type is shown here. The beauty and attractiveness of bungalows depends a great deal on the treatment of many small details that will either make a house that will command attention or will relegate it to the commonplace.

The method of handling the gable lattice work in this design shows how attractively this important ventilating arrangement—which should be provided for every one-story house—can be handled. It is a real decoration; and while unusual and artistic, can be made at a small expense. The lattice work in this gable is made of wide strips in one direction and narrow in the other. On the right side of the gable, toward the house, the wide strips are vertical and the narrow ones are horizontal. On the left side the arrangement is reversed. The wide strips run horizontally and the narrow ones vertically.

The front bay window, in the library, is divided into narrow frames, of which there are five; and the panes in these are leaded. The window box adds to the striking appearance of this handsome window.

In small bungalows the porch should be made large, since a bungalow is suggestive of outdoor living and the porch is used a great deal. This bungalow is no exception to this and has a roomy porch intended for use as well as for ornamental purposes. The overhanging roof; heavy, tapering pillars; and wide windows from the living room all add to the cozy impression this bungalow porch creates.



Floor Plan, Size 34′ x 35′.

The floor plan calls for a library, a dining room, a living room, a bedroom, and a kitchen. If necessary, the living room can be used as a bedroom and the library and dining room used as living rooms. There is an abundance of closets.

The reception hall opens into the dining room on the left thru a cased opening and on the right are double sliding doors that go to the living room. In the back of the hall is an ample closet for wraps of various kinds.

The dining room and library should be finished in the same style, because they will probably be used together a great deal, and also the cased opening between them is so wide that they give the impression of being one big room. Wall board paneling or a wood veneer could be attractively suited to these rooms. The buffet built into the bay window in the dining room is a feature of this room.

The library presents a cozy, homelike appearance. The beautiful bay in the front with the seat is very inviting. It is the sort of an arrangement that welcomes anyone into a room to enjoy its restful, pleasing character. On each side of the seat are built-in bookcases which are much more striking than the ordinary movable kind.

There is a hall in the middle part of the house that opens into the various rooms and adding much to the convenience of this design.

Too little attention is often paid to the arrangement of the working part of a house. People often think that the kitchen is in the back part of the house and not noticed generally and can be arranged in any way that happens to fit. As some one has said, "Too often houses are built with a Queen Ann front and a Mary Ann back." The kitchen should be arranged so as to save steps.

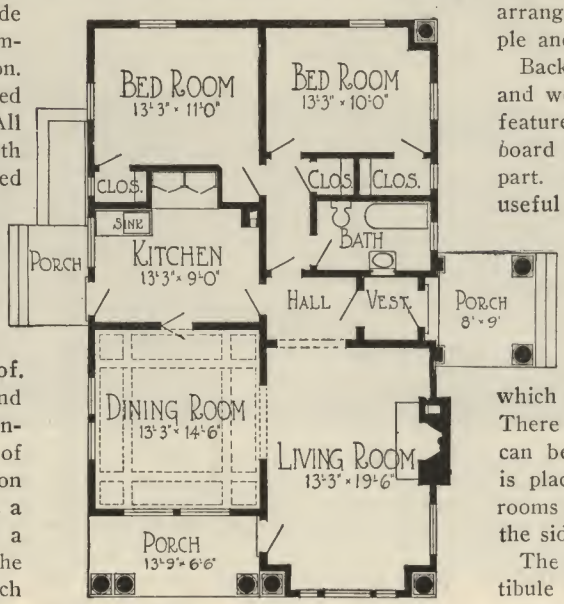
Cement Stucco Bungalow with Colonial Features

There is a certain fascination about a house that is finished with the white pillars and the projecting porches, such as the Colonial houses had,—a comfortable, home-like character that is hard to find in most other houses.

The design shown here has some of the features that characterize Colonial designs on a small scale. The white columns and the little projecting side porch and also the heavy massive chimney all combine to give this impression. The whole arrangement gives a dignified touch without being cold or formal. All the trim is white to harmonize with the columns and the walls are finished in cement stucco of a light gray color.

The front porch is set back under the main roof and the entrance to the house is on the side of the porch and goes directly into the large living room. On each side of the porch are double pillars supporting the roof.

The living room is of good size and is well arranged. It has a broad window of three frames facing the front of the house and another wide window on the side. Next to this side window is a large fireplace that can be built of a material that will harmonize with the method of finishing the interior. Each person has his own idea of decorating interiors and the owner is the one to be satisfied, so we cannot tell just how to finish the fireplace. Next to the fireplace in the back corner is a little nook that can be utilized in various ways. A seat could be built in here or the corner could be used to hold two bookcases, one along each wall. The use of this corner is also a matter of personal choice which each person has to decide for himself. It could also be used very well for holding a couch. In the back of this room is a cased opening leading to the back hall which connects to the side porch by means of a vestibule. There is also another opening from the living room to the dining room.



Floor Plan. Size, 28 by 46 Ft.

The dining room is directly back of the front porch and has a wide double window opening on to the porch. The ceiling of this room is finished in an attractive panel design with beams. This arrangement of the beams is very simple and makes a fine appearance.

Back of the dining room is a compact and well arranged kitchen. One of the features of this room is the little cupboard built into the recess in the back part. The porch is handy and is very useful in the summer as an accessory to the kitchen. The sink is placed along the wall near the window so that it will have plenty of light.

The back part of the house is taken up with two bedrooms, which are well supplied with closets. There is also a closet in the hall that can be used for linen. The bathroom is placed in front of one of the bedrooms and back of the entrance from the side porch.

The side porch opens into a little vestibule and from there into the convenient back hall.

Stucco bungalow of five rooms. Size, 28 by 46 feet. We can furnish complete set of blueprinted working plans and typewritten specifications for only $7.00 per set. Blueprints consist of basement plan; roof plan; main floor plan; front, rear, two side elevations; wall sections; and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter. When ordering, ask for Design No. 6731.

Bungalow with Attractive Paneled Stucco Walls

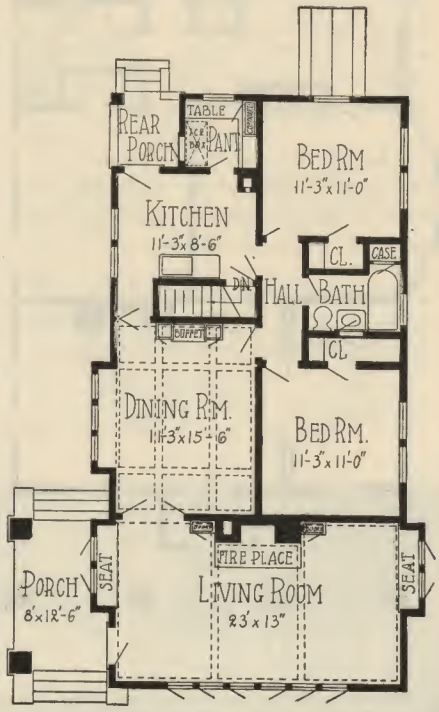
The accompanying perspective shows a stucco exterior that is finished in an unusually attractive way. The stucco is a rather light color and is divided into panels by dark stained wood strips. Typical broad overhanging eaves of the bungalow type are provided and are supported in front by brackets that are of the same dark color as the panel strips. This dark wood contrasts in a pleasing way with the white woodwork of the window sash.

Another distinctive part of the exterior is the side entrance porch. This is small with an almost flat roof built out over it. The porch pillars are made in the same way as the foundations and are constructed of stone. They could of course be built of cement blocks or of stucco designed in some way to harmonize with the stucco walls.

The living rooms occupy the entire front part of the house, while back of this on one side are two bedrooms and a bath, and on the other are the dining room and kitchen.

The living room is arranged in a very artistic and attractive way. The ceiling is beamed and the fireplace is located along one of the long sides. It is flanked on either side by a small bookcase. To balance up the rooms, with a fireplace located in such a way, it is necessary to provide some arrangement that will break up the flat wall surface at either end of the room. This is handled in a mighty attractive way. At either end, opposite each other, is a seat built out into a window of two frames. Opening toward the front of the house is a battery of six casement windows that help considerably in making this room very attractive.

The dining room also has a beamed ceiling and can be finished in much the same style as the living room. It is connected to the living room by a double swinging door. In keeping with the many windows in the living room, the dining room is arranged with a bay window containing three broad frames that cover almost all of one side of the room. A buffet is built against the back wall. The hall, which connects up the sleeping part of the house with the rest, is reached thru a door in this room.



Floor Plan, Size 24 by 48 Ft.

The kitchen is of the compact type, in which all the necessary parts are supplied with the minimum of waste space. Its arrangement eliminates the walking back and forth over a large floor space and cuts down the hard work in the kitchen to a large degree. One of the most important parts of the time and labor-saving kitchen arrangement is the pantry, placed alongside the back porch in the rear of the kitchen. On one side is a cupboard and in the end is a table. Along the other side, opposite the cupboard, is placed a refrigerator that is arranged to be iced from the back porch.

The house is set well above the ground so that a good basement can be provided. This basement will have room enough so that all the rooms that are so useful in a basement can be easily provided for. There will also be plenty of headroom for any kind of a heating plant that is decided upon. The basement is equipped with an inside and an outside entrance which increases its usefulness considerably. The two bedrooms and the bathroom can be reached thru the hall that has doors opening into it from the dining room and the kitchen.

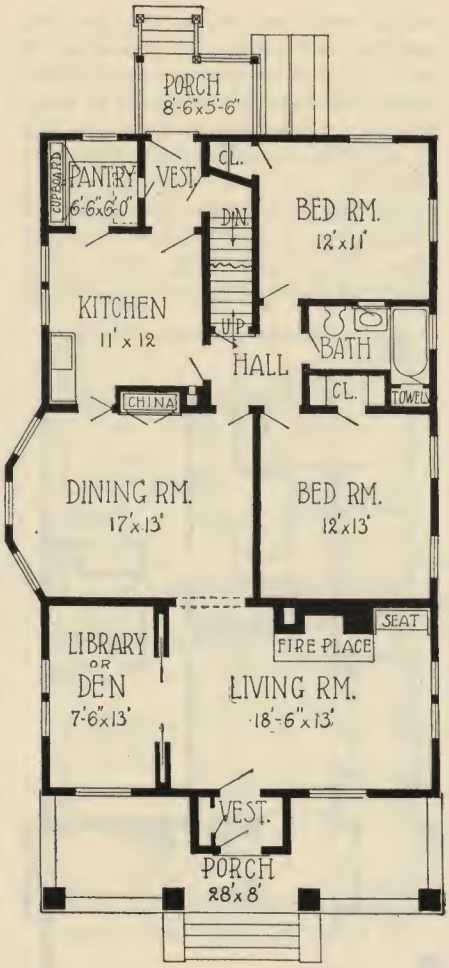
Paneled stucco bungalow of five rooms. Size, 24 by 48 feet. We can furnish complete set of blueprinted working plans and typewritten specifications for only $6.00 per set. Blueprints consist of basement plan; roof plan; main floor plan; front, rear, two side elevations; wall sections; and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter. When ordering, ask for Design No. 6762.

Well Arranged Six-Room Cottage

One of the distinctive features of the house shown here is the vestibule built out onto the front porch. The arrangement of a double-door entrance into the house helps considerably in the heating problem. The cold air does not blow in each time that the door is opened. It gives the same protection that a storm door would, but is finished in such a way that it does not have the rough and unattractive appearance of the average storm door.

The living room is of good size and with the library or den extends across the front of the house. The fireplace in the living room is not placed on an outside wall in the usual way, but is against one of the interior walls. Next to the fireplace is a seat which, set back the way it is, makes a little cozy corner to add to the comfort of this room. The room is kept cheerful and well lighted by two windows on the side and another window opening to the front porch.

It is often desirable to have a room that can be shut off from the rest of the house when occasion demands. The small room off the living room is designed with this object in view. It is separated from the living room by double sliding doors, which can be opened to make one large room across the front of the house when needed. The sliding doors will cut this room off from the rest and will make a quiet part of the house. This room can be made very attractive with some well chosen furniture arrangement of the room.



The dining room is almost as large as the living room and presents some very attractive features. A large curved bay extends along one side of the room, and gives a bright appearance to the room. In a recess in the back wall is a built-in china case that adds to the convenience and beauty of this room.

Both an inside and outside entrance are provided for the basement. This is an arrangement that will be appreciated by the lady of the house as it prevents the kitchen from becoming dirty because of the tramping back and forth thru the house in going from the basement to the back yard. The house is built high enough on its foundations so that plenty of head room is furnished for a heating plant.

The kitchen is well arranged and the sink is placed next to the two windows on the side so that it is well lighted. Housewives say that a well lighted sink is one of the most important things in a kitchen.

Storage space is provided for in the attic, which is reached by the stairs opening into the back hall. A room could be finished off here if desired.

Six-room homelike cottage. Size, 30 feet 6 inches by 46 feet 6 inches. We can furnish complete set of blueprinted working plans and typewritten specifications for only $6.00 per set. Blueprints consist of basement plan; roof plan; main floor plan; front, rear, two side elevations; wall sections; and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter. When ordering, ask for Design No. 6745.

Striking Bungalow Design of Five Rooms

A most striking impression is created by the little bungalow shown here as Design No. 6795. The combination of the porch construction and the way the front of the house is finished will cause anyone to stop and notice this distinctive design.

The porch is built with no roof and is made very inviting by the broad door, flanked by windows, leading into the house. The projecting roof with its uncovered supports is typical of bungalow construction and is in keeping with this particular design. The dark finish of this roof and also the front door provides a pleasing contrast with the white walls of the bungalow.

Another unusual decorative feature is the balcony with its ornamental iron railing in front of the French windows.

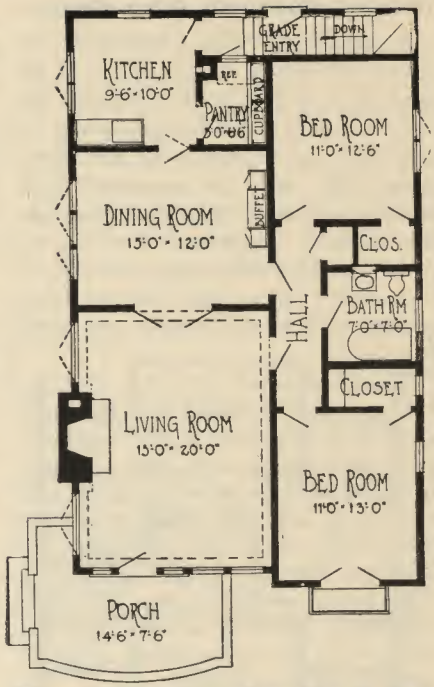
The walls of this attractive design are made of stucco which can be placed on either wood or metal lath. This method of construction is becoming more popular all the time and has many good features that will recommend it to the home builder.

The floor plan shows a room arrangement that is very pleasing—the living room especially is just the sort of a room that one would expect to find in a home with such an artistic exterior. This room is entered directly from the front porch and its large size presents a pleasing aspect. It is twenty by fifteen feet and the large fireplace is located in the center of the outside wall with double casement windows on each side. This room is connected to the dining room by double swinging doors.

The dining room is well lighted by three casement windows along the wall. Opposite these is a built-in buffet that will add to the usefulness and convenience of this room.

The kitchen is almost a model for a house of this size. It is small and compact and is arranged to cut the work that must be done to a minimum.

Two bedrooms with a hall and bathroom between occupy one side.



Floor Plan of Bungalow, Size 27 feet 6 inches by 44 feet.

Cement stucco bungalow of distinctive design. Size, 27 feet 6 inches by 44 feet. We can furnish complete set of blueprinted working plans and typewritten specifications for only $5.00 per set. Blueprints consist of basement plan; roof plan; main floor plan; front, rear, two side elevations; wall sections; and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter. When ordering, ask for Design No. 6795.

Family House of Nine Rooms

A cozy little nook is a most desirable feature to have in a house if it is at all possible to include it in the plans. It makes a quiet and attractive corner in which to read or just to sit and think. These little nooks are sometimes built merely as a small seat set back alongside the fireplace. Sometimes they are alcoves and other times they are really a part of the living room and are large enough to hold the fireplace and some bookcases.

The one shown in this plan is of the last type. It is separated from the living room by a colonnade which contains a small bookcase on each side. Another bookcase could be placed along the wall opposite the seat. The seat extends from the fireplace along one wall under the windows. On the opposite side of the fireplace is a small bookcase. This nook will either serve as a cozy, secluded corner or it can be considered as a part of the large living room.

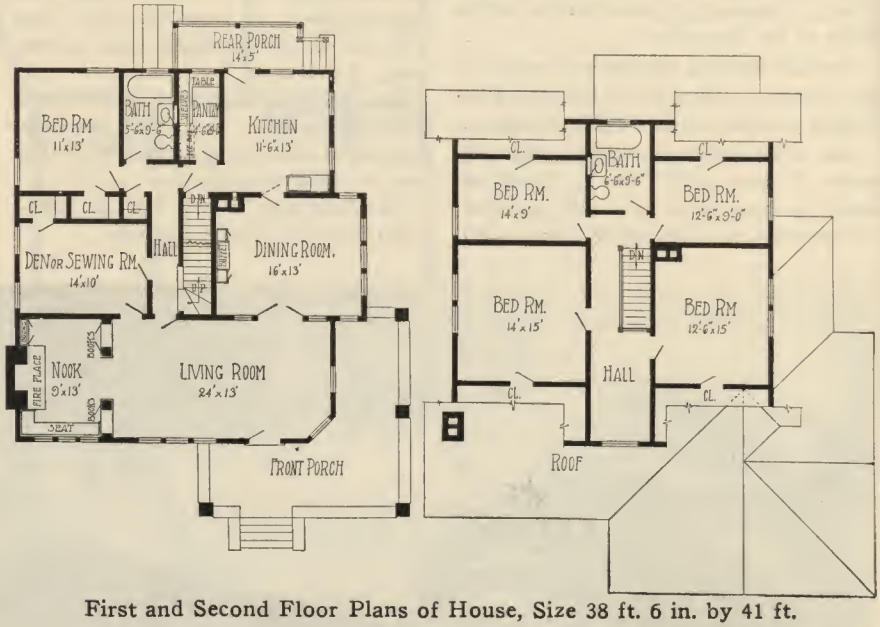
The living room is very attractive and is well lighted so as to be bright and cheerful.

The basement is a very important part of this design. In a house as large is this one, a good basement is necessary for several reasons. In the first place, it is desirable to have an efficient and satisfactory heating plant; and this cannot be accomplished unless there is plenty of head room. The basement under this house should also be large enough so that it can be used for various other purposes. A laundry should be built and careful attention to its design with regard to convenience will be time well spent. In some corner, as far from the heating plant as possible, a store room should be provided for fruits and vegetables. A small workshop could also be provided in some part of the basement that is not being otherwise used.

The basement is reached by stairs that open into the back hall on the first floor. All the rooms on the first floor, with the exception of the dining room, can be reached thru this hall. A back hall such as this has a marked effect in preserving the privacy of each of the rooms, as it is not necessary to go thru other rooms to reach any one room.

One bedroom is provided on this floor and also a bathroom. The den or sewing room can also be pressed into service as a bedroom if the occasion demands. This will hardly be necessary, as there are four more bedrooms on the second floor. Another bathroom is also located on the second floor.

On the opposite side of the house from the bedroom, on the first floor, is the dining room and the kitchen. The dining room is connected to the living room by double swinging doors. A large convenient buffet is built against one wall of the dining room opposite the windows. There are three fairly wide windows along the wall and also a smaller one that opens to the front porch. There is also another small window opposite this.



First and Second Floor Plans of House, Size 38 ft. 6 in. by 41 ft.

Nine-room house with stone porch trim. Size, 38 feet 6 inches by 41 feet. We can furnish complete set of blueprinted working plans and typewritten specifications for only $10.00 per set. Blueprints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections; and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter. When ordering, ask for Design No. 6752.

Story-and-a-Half House of Attractive Design

The accompanying floor plans and perspective show a pleasant and convenient house for the family. On the first floor there are four rooms, while on the second floor there are three bedrooms and a bathroom.

An unusual feature of the plan is the window arrangement along the front of the house facing out to the broad porch that extends across the entire front of the house. Considerable ingenuity has been used in arranging the front of the house in order to make it distinctive and artistic.

The house can be entered from three different doors opening to the porch. Directly in front of the steps is the main front door which leads into a hall. On each side of this are French doors to the living room and the dining room. On each side of all three doors are narrow panels that extend from the porch roof to the floor. Each of these contains small panes of glass for its entire length. The arrangement makes the entire front of the house into one large window and adds to the value of the porch in the summer time, as it really seems to be a part of the house.

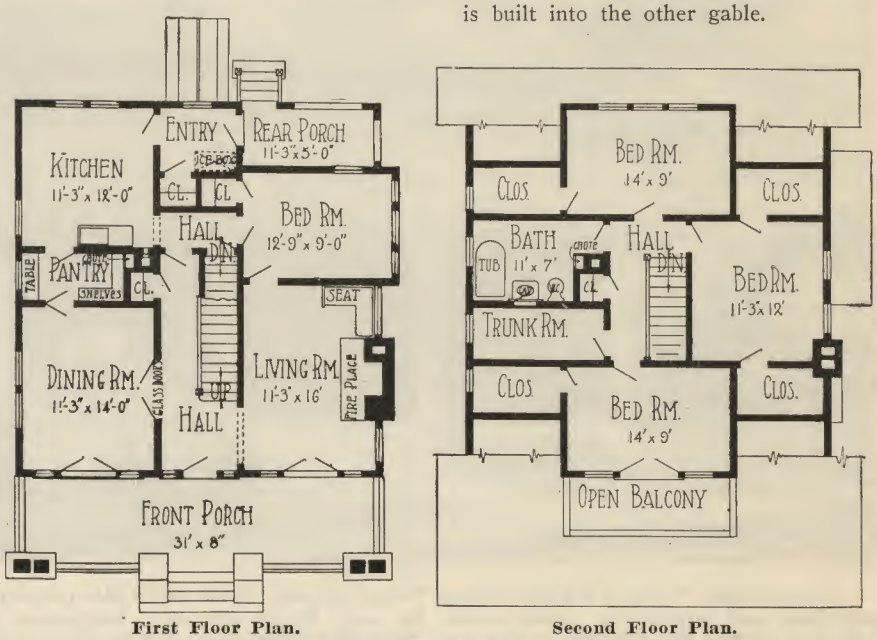
The hall thru the central part of the first floor makes the room arrangement convenient and the rooms readily accessible. The stairs to the second floor are also reached thru this hall.

The living room is of good size and has a large fireplace built along one of the walls. On each side of the fireplace is a wide window. These two windows together with the ones along the front make the room very cheerful and bright.

The dining room is of the same width as the living room, but is slightly shorter. It is also made very bright by the use of plenty of windows.

One of the most desirable features of the kitchen is the back porch, which will be useful as a kitchen annex during the warm months.

On the second floor three bedrooms are included in the plan. Two of the bedrooms are built into dormers, and the other into the gable. The bathroom is built into the other gable.



First Floor Plan. **Second Floor Plan.**

Arrangement of House, Size 31 by 32 feet.

Seven-room story-and-a-half house of comfortable design. Size, 31 by 32 feet. We can furnish complete set of blueprinted working plans and typewritten specifications for only $10.00 per set. Blueprints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections; and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter. When ordering, ask for Design No. 6768.

Comfortable Colonial Family House. Size, 28 feet by 41 feet. We can furnish complete set of blueprinted working plans and typewritten specifications for only $10.00 per set. Blueprints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections; and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter. When ordering, ask for Design No. 6854.

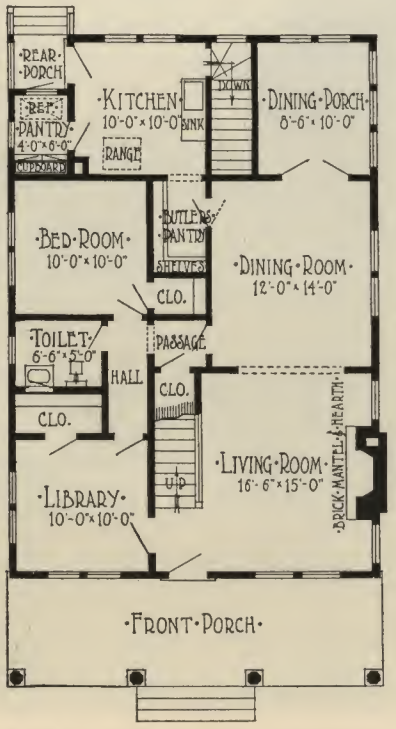
Story-and-a-Half Shingle House

Design No. 6854 is a house of Colonial style in the story-and-a-half type. Its exterior is simple yet pleasing and the interior arrangement includes a full list of the several advantages of this type of construction. The sides of the house are finished with shingles. The roof is of unusual design and constitutes a mark of distinction in this design. The main roof is of the pitch type while a secondary roof over the first floor rooms at the rear is of the gambrel type. Four round columns are used on the porch and the usual rail is eliminated. Chimneys are rather massive in accordance with the usual design in Colonial style houses.

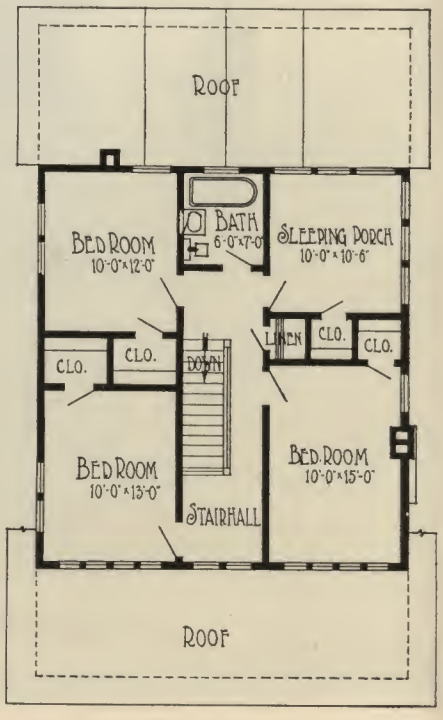
The front part of the house on the first floor is occupied by the living room and library. The living room and dining room are closely connected, there being a wide cased opening between these rooms. A dining porch forms an attractive feature at the rear of the dining room. Between these rooms and the kitchen there is a butler's pantry fitted with shelves. Another pantry, in which the cupboard is built and space is provided for the refrigerator, opening from the kitchen.

A bedroom and toilet are also furnished on the first floor. Halls make all rooms easily accessible.

The second floor space is divided into three bedrooms, a sleeping porch and a bath. A large hall and generous closet space are obtained.



First Floor Plan.



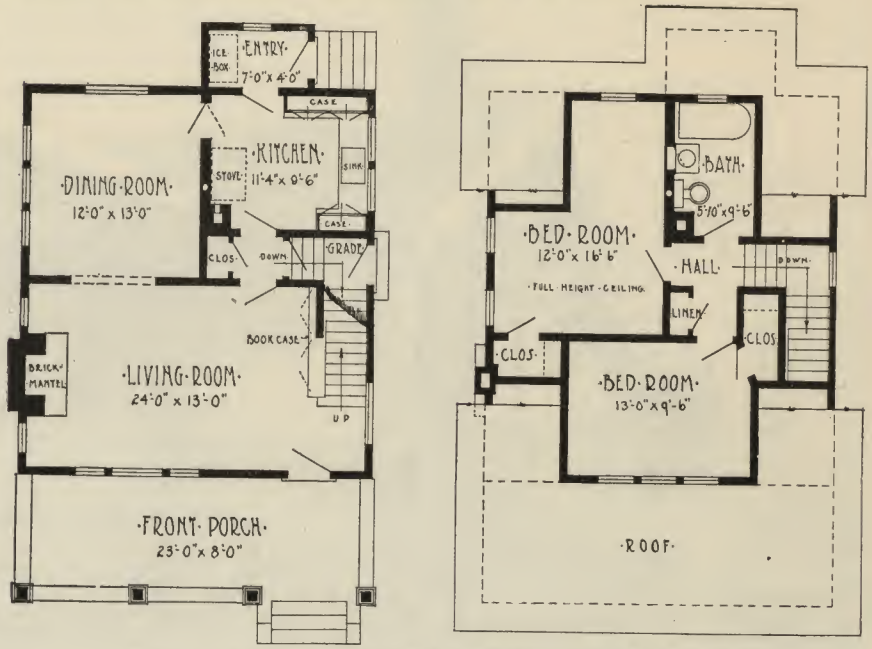
Second Floor Plan.

Arrangement of House. Size, 28 feet by 41 feet.

A Small House With Large Rooms

This little house is given an outside finish, which is unique, in that it employs three of the recognized materials used in the best building construction today. The porch and outside chimney are of dark colored brick laid with white mortar. The top course of the porch rail is laid with the brick on edge, the white stone cap being placed above this course. A very pleasing effect is produced in this way. The porch columns are square, built of wood, and the sides of the house are finished up to the top of the first floor windows with beveled wood siding. This wooden portion of the house is preferably finished with a light body and darker trim in order to harmonize properly with the brick of the porch and chimney. The upper portion of the house is finished in stucco, which may be given a color to suit the desire of the owner. Window trim will match that of the lower portion of the house. The portion of the foundation wall which extends above the ground level is built of rough rock-faced concrete blocks. The ends of dormer rafters are exposed, as are those of the main roof, extending over the porch. A concrete floor is placed on the front porch, which is drained thru four openings left in the brickwork of the railings.

The interior scheme of this little home is characterized by the intent to eliminate all possible waste space and thus increase the size of rooms. The living room extends across the entire width of the house. A fireplace with brick mantel is built into the wall at the left of the entrance, and the staircase is situated along the wall at the other end of the room. Bookcases are built into the side of the staircase.



Arrangement of House. Size, 25 Feet by 27 Feet 6 Inches.

Cozy home of five rooms. Size, 25 feet by 27 feet 6 inches. We can furnish complete set of blueprinted working plans and typewritten specifications for only $8.00 per set. Blueprints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections; and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter. When ordering, ask for Design No. 6813.

Comfortable Eight-room House. Size, 32 by 42 feet. We can furnish complete set of blueprinted working plans and typewritten specifications for only $10.00 per set. Blueprints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections; and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter. When ordering, ask for Design No. 6750.

Eight-Room Bungalow with Garage to Match

Here is an exceptionally commodious story-and-a-half bungalow, containing six rooms and bath on the first floor and two rooms and bath upstairs. An extra amount of closet space is included.

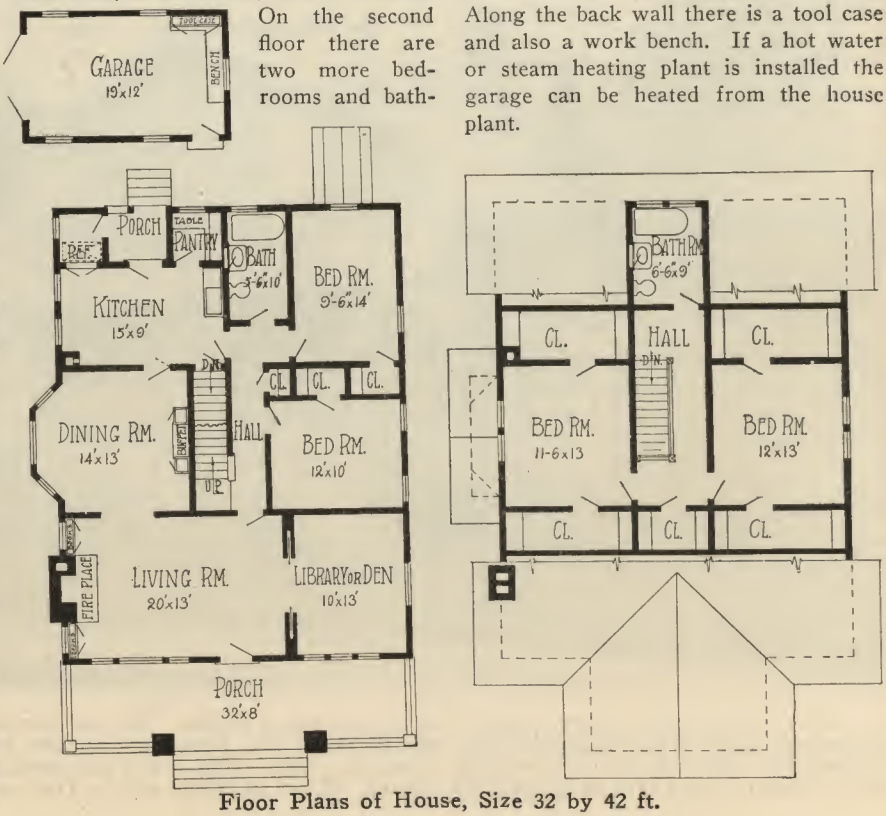
An attractively designed door such as the one shown in this design always makes a good impression on anyone entering the house. It puts everyone in a mood to appreciate the interior.

This door has three glass panels across it and they vary in length from left to right. The one on the left being the shortest of the three. There are also broad brass plates at the top and bottom of the door and a heavy brass knob and plate to match. The whole combination makes a door that lends distinction to the house.

The front part of the house is occupied by two rooms that may be used together whenever occasion demands. These two rooms are the living room and a den or library. The two rooms are connected by a double sliding door. The den can thus be cut off from the rest of the house if the man of the house desires to do some of his office work at home. When the door is open it leaves a large unobstructed space across the front of the house which will be very useful in entertaining. The dining room will add to this space also.

This lower floor plan also calls for two bedrooms, a bathroom, and a kitchen. On the second floor there are two more bedrooms and bathroom. Plenty of closet space is provided on this floor for all purposes.

Back of the house is a garage which also serves the purpose of a tool shop. Along the back wall there is a tool case and also a work bench. If a hot water or steam heating plant is installed the garage can be heated from the house plant.



Floor Plans of House, Size 32 by 42 ft.

Six-Room Two-Story House

The accompanying floor plans and perspective show a small two-story house with a good arrangement. On the first floor are the living rooms, while on the second are the bedrooms and a bathroom. There is also a den on the first floor that can be used as a bedroom if desired.

The exterior shows this design as a compact and fairly small house that has a pleasing appearance. The walls are finished in shingles up to the plate and the gables and sides above this are in stucco. The gable is finished in an attractive panel design, which is built around the windows. The front porch is built out from the house under a separate roof.

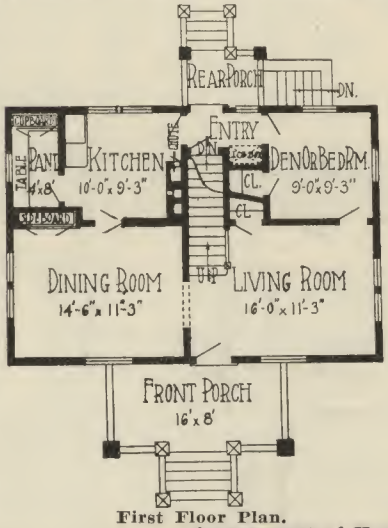
The house is built well up from the ground, as shown, so that plenty of room is provided in the basement.

The four rooms on the first floor are each set in one corner. At the front two corners are the dining room and living room, while in the back there is the kitchen and den.

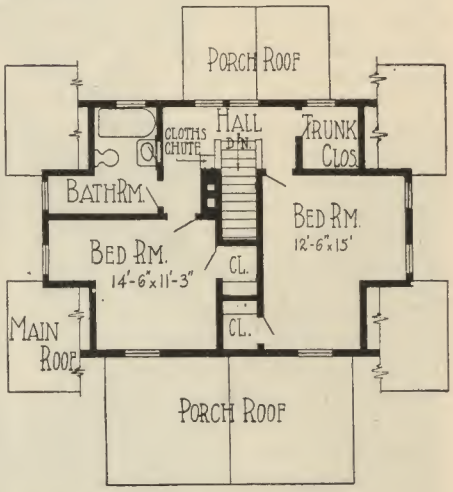
The living room and dining room are much the same in general shape and style, tho the living room is larger. Both have their windows placed in much the same way. Each has a window toward the front of the house and two on the side. The entrance to the second floor is thru the living room. In the back part of the dining room is a cupboard that is built back into a little alcove. The living room and dining room are connected by a cased opening.

The kitchen is compact and the pantry with its convenient arrangement forms a valuable addition to it.

On the second floor the bedrooms are built in the two front corners of the house and have windows opening toward the front and toward the side thru dormers. It is a good arrangement, as it gives each bedroom an exposure on two sides.



First Floor Plan.



Second Floor Plan.

Arrangement of House, Size 32 feet by 22 feet.

Modern two-story, six-room house. Size 32 by 22 feet. We can furnish complete set of blueprinted working plans and typewritten specifications for only $7.00 per set. Blueprints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections; and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter. When ordering, ask for Design No. 6763.

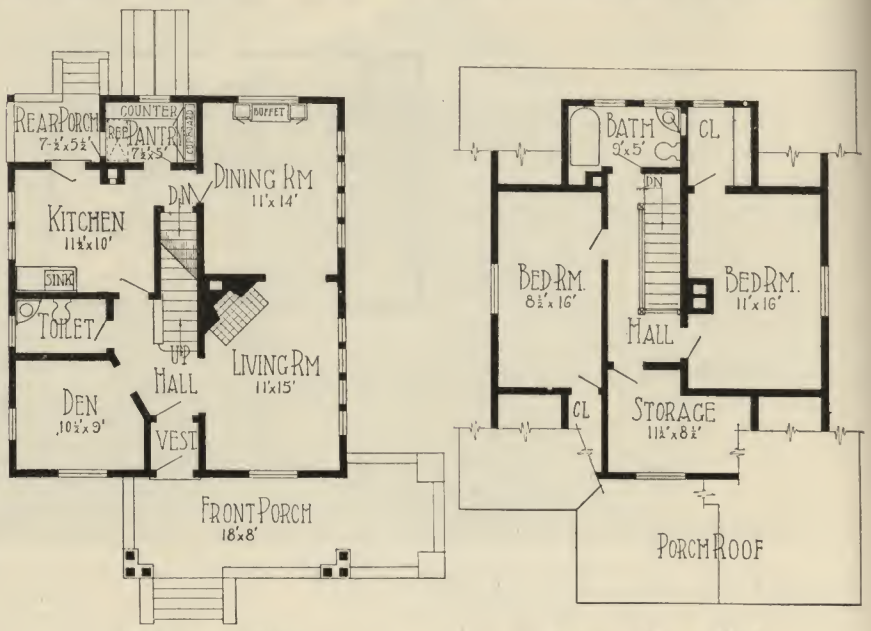
A Pleasant Six-Room House

This neat little home is one of the kind that often calls forth the remark, "I should think you would want to stay at home all of the time." It has every convenience which is needed to make it an ideal home for a small family. The suggestion of a homelike atmosphere is sensed even before the house is entered. The bungalow idea is evident in the broad, low lines of the roof and several unique features have expressed themselves in the exterior design. The heavy exposed timbers arranged in pairs under the roof give an air of distinction to the house. The gable of the porch roof materially sets off the front of the house and the entire porch design is very effective. The rail is low and is carried out to extend the porch beyond the columns in line with the side of the house. Two posts are set at the outside corners of this extended portion of the porch. Flower baskets set upon these posts would produce a very artistic effect. The sides of the house are finished with beveled siding and the window trim is a little out of the ordinary, in keeping with other features of exterior design.

A small vestibule is entered from the front porch, and this leads into the hall from which the various rooms of the first floor and the stairs to the second floor are reached. The large living room has a fireplace set into one corner. Four windows are built into the side wall of the house in this room, and one large window is placed at the front. The living room is always a pleasant room when the fireplace is set into one corner, but it is seldom that this is possible without interfering with the arrangement of some other part of the house.

The dining room is in the rear of the living room. The buffet is built against the rear wall with a wide window above it. Four windows occupy the side wall in this room, similar to the arrangement in the living room. A hall leads past the pantry to the kitchen. The kitchen is fitted with a sink set into the corner opposite the hall. A chimney has an outlet, between the door to the rear porch and the pantry, for the kitchen stove. The pantry is an ideal one, with a counter and cupboard. The refrigerator is placed in the pantry and is iced from the rear porch. A little den and a toilet are also placed on the first floor.

Two bed rooms, a bath and a storage room occupy the second floor. A long hall extends parallel to the staircase.



First Floor Plan. Second Floor Plan.

Arrangement of House, Size 27 Feet 6 Inches by 31 Feet.

Six-room home with many special features. Size, 27 feet 6 inches by 31 feet. We can furnish complete set of blueprinted working plans and typewritten specifications for only $10.00 per set. Blueprints consist of basement plan; first and second floor plans; front, rear, two side elevations; wall sections; and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter. When ordering, ask for Design No. 6833.

Well arranged seven-room cottage. Size, 26 feet 6 inches by 42 feet 6 inches. We can furnish complete set of blueprinted working plans and typewritten specifications for only $6.00 per set. Blueprints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections; and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter. When ordering, ask for Design No. 6716.

Bungalow Cottage with Paneled Gable

The exterior of the house shown in the accompanying illustration presents an unusual and attractive way of finishing the outer walls of a bungalow. It is a mixed style. From the ground to the sill course the walls are of wide siding stained dark; from the sill course to the belt course the walls are finished in clapboards painted a lighter color; above the clapboards are dark shingles up to the plate; and the gable above is finished in stucco with half-timber panels.

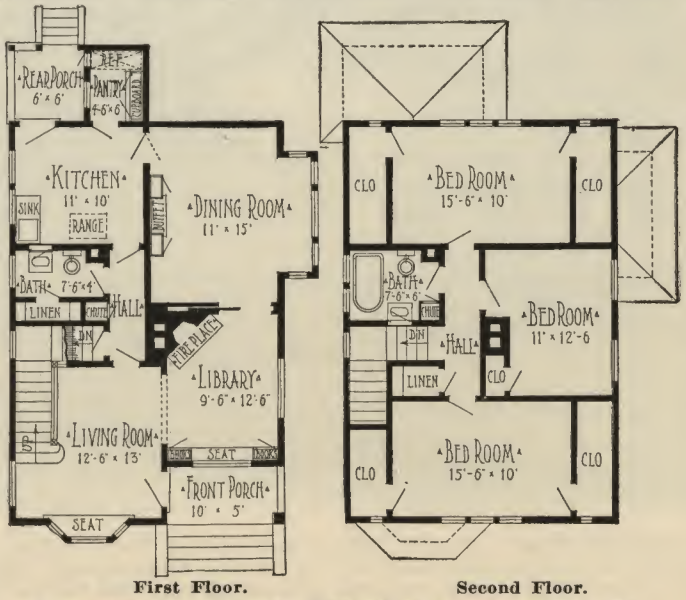
Three windows occupy the panels in the center and the two smaller windows, one on each side to light the closets, are unusual. Paneled stucco makes one of the best ways of finishing a gable. The paneling can be handled in so many different ways that it can always be made distinctive.

The library of this house is perhaps the most inviting room on the first floor. Tho not very large, it is artistically arranged. Across the broad window that opens to the porch is a seat which is flanked on each side by bookcases. The big brick fireplace is handled in an unusual way. It is placed diagonally across a corner of the room.

The living room in this design serves as a reception hall also. The entrance from the front porch is directly into this room. Also the stairs to the second floor are placed here across from the entrance.

The kitchen is almost a model for a modern house. It is made small and compact without being crowded in any way. The pantry is conveniently placed near the dining room where its use will not require a lot of extra steps. This pantry contains a cupboard and an outside iced refrigerator and is well lighted by a window facing out on the back porch. The sink is placed in the corner of the kitchen under one of the windows, so it will get plenty of light. The handy covered rear porch will be used a lot in summer time as a part of the kitchen.

Lots of closet space is provided on the second floor which will bring joy to the housewife. Both the front and back bedrooms are equipped with two closets under the eaves of the house. There is also a closet in the other bedrooms and one in the hall for linen. One of the great advantages of the story-and-a-half type of house is abundant closet space.



Arrangement of House. Size, 26 Ft. 6 In. by 42 Ft. 6 In.

Artistic Dwelling of the Bungalow Type

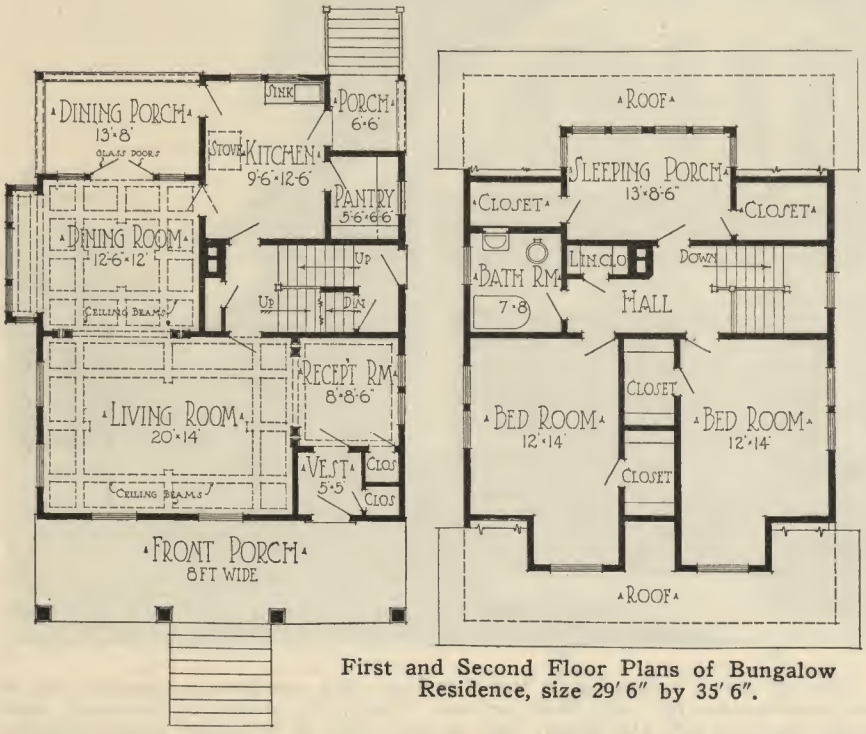
The exterior of the house shown here is most inviting and has a pleasant home-like appearance. The broad veranda has a built-in look because it is under the main house roof. The sides up to the plate can be finished in various ways. In the illustration it is shingled; but it would also be very attractive if done in clapboards or cement stucco. An unusual effect is created by the paneling below the plate on each side of the house. Above the plate in the gables the walls are shingled. The double dormer facing the front and the single one in the back add to the pleasing impression that this house makes on everyone.

The entrance from the front porch is at the side into a vestibule which opens into the reception hall. This hall is connected to the living room by a cased opening.

The living room and dining room are finished in the same style and are joined by a wide cased opening so that they can be used together. Both these rooms have beam ceilings, which is one of the most artistic ways of finishing a room. A beam ceiling gives an atmosphere of coziness and comfort that cannot be had in any other way.

Back of the dining room is a dining porch and between the two are double full glazed doors. This porch can be screened in so as to add to its usefulness. A screened porch of this kind is a great comfort. Some porch furniture such as a swing and easy chairs will make a porch such as this the most used part of the house during the hot months.

On the second floor there are two bedrooms, a bathroom and a sleeping porch. A large amount of closet space is furnished in this design. There is a large one in each bedroom and also two opening into the sleeping porch.



First and Second Floor Plans of Bungalow Residence, size 29′ 6″ by 35′ 6″.

Seven-room residence of pleasing design. Size, 29 feet 6 inches by 35 feet 6 inches. We can furnish complete set of blueprinted working plans and typewritten specifications for only $7.00 per set. Blueprints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections; and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter. When ordering, ask for Design No. 6713.

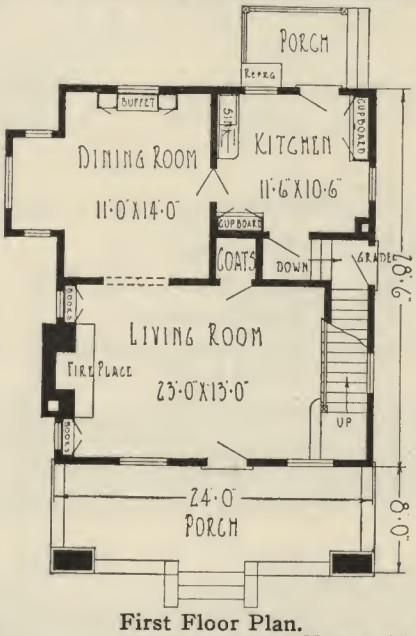
A Novel Design with Many Desirable Features

It is not very often that the combination of stone masonry and stucco is used in house construction, and it is a peculiar fact, for the appearance of a structure built in this way is altogether pleasing and satisfactory. The design shown here would attract favorable comment no matter what its surroundings. The massiveness of the masonry work fits well into the design and the stucco carries along the general idea to the smallest detail. Stone are used in building the porch wall and the chimney. The porch columns are built of wood with stucco finish and only two are used. The floor of the porch and the steps are made of concrete. The roof is of the gable type and triangular wooden brackets are set against the sides of the house where purlins project to support the rafters placed outside of the walls.

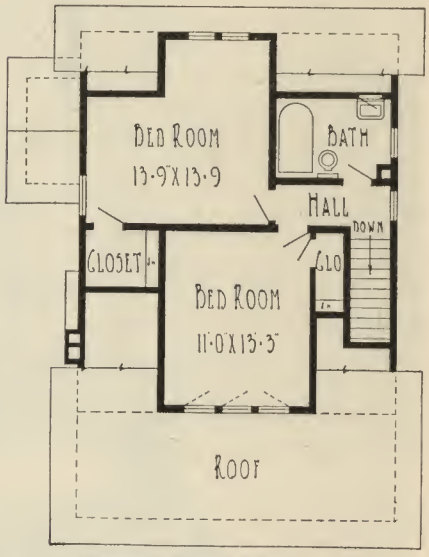
The most pleasing feature of this design is found upon entering thru the front door into the living room. This room occupies the entire forward one-half of the first floor. An open stair case is built along one end of the room. At the bottom of the stair is a landing which is two steps above the level of the living room floor. The first step is curved, at its inner end, back to the staircase. At the other end of the room is a large fire place with a book case on each side. A small closet for wraps is placed directly in front of the door opening upon the porch. A cased opening leads to the dining room.

Upon entering the dining room, the buffet is directly in front, built under a window in the rear wall of the house. A three-window bay admits light into the room from the side of the house. The kitchen occupies the remaining portion of the rear one-half of the first floor. Two cupboards are furnished in two corners of the room, and the other two corners are occupied by the chimney and sink. This arrangement results in great economy of space. The rear porch is of generous size and provision is made for the refrigerator here.

Two pleasant bed rooms and a bath occupy the second floor. Each bed room has a closet with shelves.



First Floor Plan.



Second Floor Plan.

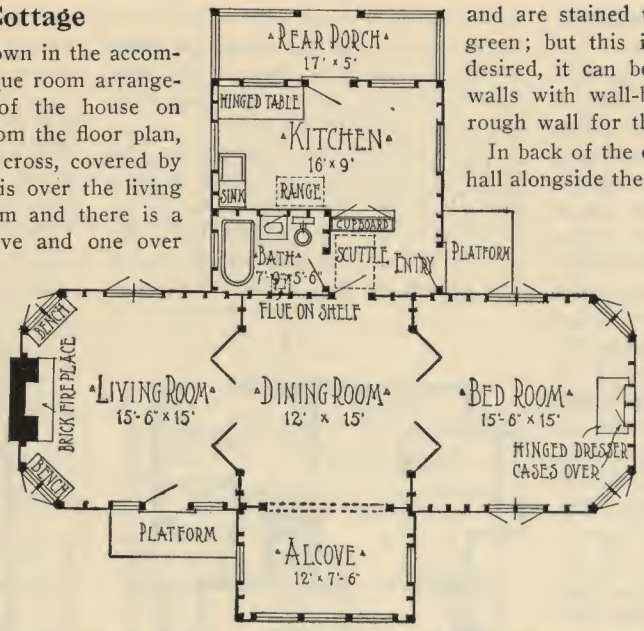
Arrangement of House, Size 24 Feet by 28 Feet 6 Inches.

Home-like Five Room Stucco House. Size, 24 feet by 28 feet 6 inches. We can furnish complete set of blueprinted working plans and typewritten specifications for only $8.00 per set. Blueprints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections; and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter. When ordering, ask for Design No. 6835.

"House Party" Cottage

The feature of the design, shown in the accompanying illustrations, is the unique room arrangement and the general shape of the house on the ground. As can be seen from the floor plan, the house is in the shape of a cross, covered by three gables. The main gable is over the living room, dining room and bedroom and there is a projecting gable over the alcove and one over the kitchen and back porch.

The room arrangement is decidedly unique. The whole main part of the house can be opened up so as to give an extremely large unobstructed floor space. Double folding doors are placed between the living room and dining room and between the dining room and bed room. There is also an alcove off the dining room with a cased opening between. When all this floor space is opened up, plenty of room is assured for an informal dancing party or entertainment of any kind.



Floor Plan Suggests House Parties and Dancing. Size over all, 45 by 46 feet.

All the windows in this part of the house, with the exception of the alcove, are of the casement type. The alcove is built like a sun parlor with the sides made mostly of windows.

The roofs are of heavy construction, which adds to the artistic effect of this house. The sides are finished in cement stucco and, combined with the white window frames and dark trim, give a very inviting appearance to this design. Another unusual feature is the treatment of the corners. All the corners of the part of the house under the main gable are beveled off and a window is placed in each.

The entrance is a simple concrete platform—just the thing for a comfortable little summer cottage.

If you like to have a house in which you can entertain your friends, the more the merrier, we can't see how this house can be equaled. The big fireplace in the end of the living room, the casement windows, the beveled off corners, and the rough finish all combine to make a house that will attract attention anywhere.

In the living room on each side of the fireplace and under the corner windows are benches that can be made of a style to fit the furniture. This room, as well as the rest of the house, is finished rough; the studs are exposed to view and are stained tan or tobacco brown or a soft green; but this is not necessary. If a finish is desired, it can be readily obtained by lining the walls with wall-board. Many people prefer the rough wall for this type of a house.

In back of the dining room is a bathroom. The hall alongside the bathroom is used as a side entry way from the small concrete side platform. In back of the bathroom is a well arranged kitchen with plenty of room. The kitchen has one of the handy hinged tables that can be folded back out of the way when it is not in use. On the other side of the room from the table is the sink and also a range. Behind the kitchen is a large back porch which can be screened and utilized in many appreciated ways.

This design is almost ideal in many ways for a summer cottage and will also prove very satisfactory for a house to be used the year around.

An idea for ceiling construction in the front of the cottage is to use ceiling beams set 24 inches apart and finished four sides. The ceilings are not lathed and plastered. The boarding above has to be matched stuff of good quality free from knot holes and other imperfections usually countenanced for rough flooring which does not show.

In all frankness, it is doubtful if many American housewives would relish this kind of a ceiling. It harmonizes, however, with the rustic cottage idea, and in this particular instance, is very satisfactory.

Nifty cottage design of four rooms. Size 45 by 46 feet. We can furnish complete set of blue-printed plans and typewritten specifications for only $5.00 per set. Blue-prints consist of basement plan; roof plan; main floor plan; front, rear, two side elevations; wall sections; and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter. When ordering, ask for Design No. 6733.

Attractive Frame House. Size, 24 feet by 33 feet. We can furnish complete set of blueprinted working plans and typewritten specifications for only $10.00 per set. Blueprints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections; and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter. When ordering, ask for Design No. 6846.

Well Lighted Home of Six Rooms

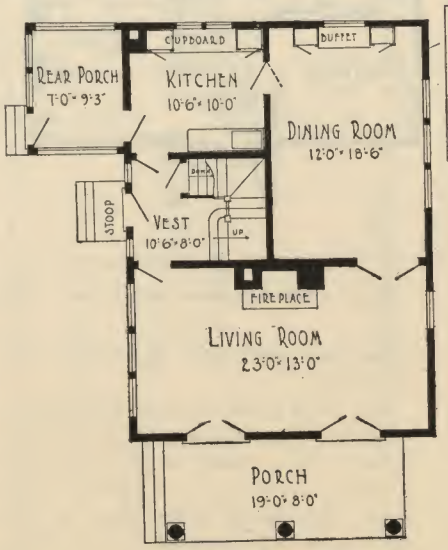
A pleasant feature of the house shown here is the exceptionally large number of windows provided. Each room is sure to be bright and cheerful. The house is rather simple in exterior design, being in the main rectangular and having a very simple hip roof without decoration other than the small dormer. The walls are finished in beveled siding laid in the usual manner with the exception of the broad belt which encircles the house just below the sills of the upper floor windows. The porch roof is practically the only portion of the exterior in which any decoration is used. The outer side of the porch roof is supported by three turned wood columns. The simplicity of this house when viewed from the outside is impressive.

The porch has no rail and the floor is of brick. Two sets of French doors open from the wide living room upon the porch. The fireplace in the living room is built into the wall opposite these doors. In addition to the light which is admitted thru the doors, there are four windows which add to the general cheerfulness of the room. Double doors lead to the dining room which is a large room having four windows. The buffet is built against the wall at the far end of the room.

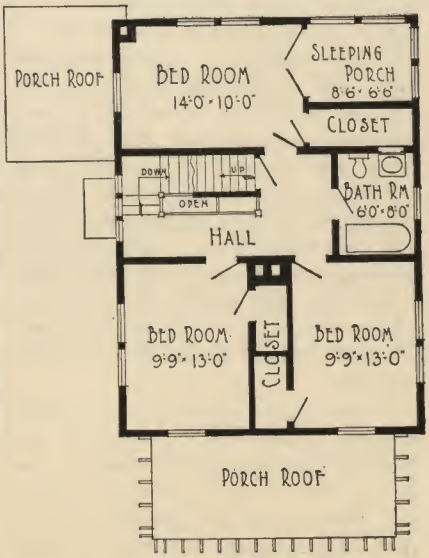
There is also an entrance into the house by means of a stoop and door leading into a vestibule between the living room and the kitchen. There are two little windows on each side of the door. An attractive staircase is built against the back wall in the little vestibule. Near the kitchen there is a door leading to the basement.

The kitchen is practically square and is fitted to save steps for those who do the work in this part of the house. The cupboard is arranged in such a manner that its central portion is built below the two windows, making a handy work table where the most light is available. The sink sits handily into the corner of the room opposite the cupboard. The rear porch is essentially another room since it is built as a closed-in porch which may have either screens or glass panel sash fitted into the openings in its walls. This porch will prove to be a very handy addition to the kitchen.

The second floor has a hall in its central part. There are three bedrooms, a sleeping porch and a bath on this floor.



First Floor Plan.



Second Floor Plan.

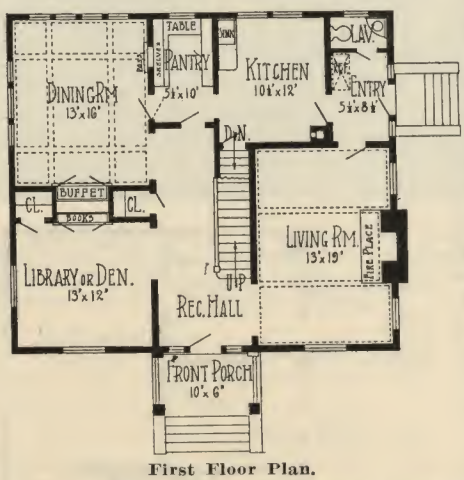
Arrangement of House. Size, 24 Feet by 33 Feet.

Comfortable Eight-room Home. Size, 37 feet by 32 feet 6 inches. We can furnish complete set of blueprinted working plans and typewritten specifications for only $12.00 per set. Blueprints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections; and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter. When ordering, ask for Design No. 6826.

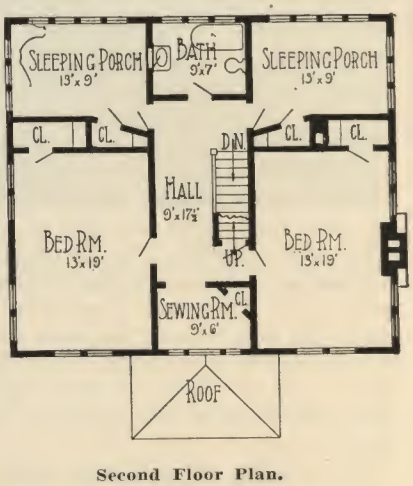
Pleasant Home of Colonial Design

Those who admire the beauty of the homes of the men whose names have come down to us from the earlier history of our country will be pleased with this Design No. 6826. These early American homes were all framed in a manner which brought their beauty out from their simplicity. Wide clapboards were used for siding and the many windows were built up with small panes of glass and provided with shutters. An outside chimney of brick was used, carried up wide at the bottom to provide for a fireplace and narrowed down near the second floor. The finish was invariably white with some dark shade of green for the shutters. The contrast of the shutters and the chimney with the white body of the house was always pleasing.

In the design shown here, the front entrance leads into a reception hall from which the stairway leads to the second floor. Cased openings lead into the living room and library near the front of the house, and into the dining room farther back. A door at the end of the hall opens into the passage thru the pantry.



First Floor Plan.



Second Floor Plan.

Arrangement of Home. Size, 37 Feet by 32 Feet 6 Inches.

The living room contains the fireplace, and the ceiling is finished with exposed timbers. The library or den is a very attractive room with its built-in bookcases. The dining room ceiling is paneled and a buffet sets into the wall between this room and the den. The rear entrance is into an entry in which the refrigerator is placed. A small lavatory is provided off this entry. The kitchen is handily arranged and well-lighted. The serving pantry is an important feature.

Two large bedrooms and two enclosed sleeping porches, a sewing room and a bath are provided on the second floor.

House with attached garage. Size, 36 feet 6 inches by 33 feet 6 inches. We can furnish complete set of blueprinted working plans and typewritten specifications for only $10.00 per set. Blueprints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections; and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter. When ordering, ask for Design 6842.

Elegant Stucco House with Garage

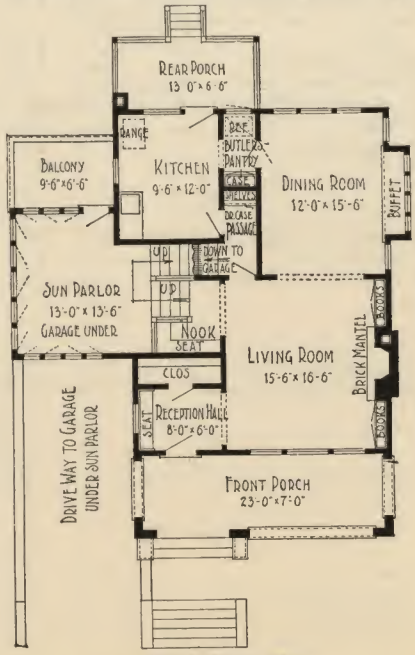
The design shown here illustrates the possibility of building a garage as a part of the house, providing a most attractive sun parlor at the same time. The house is built upon a terrace and the driveway leading to the garage is brought straight in at the sidewalk level, allowing only enough slope to provide good drainage.

The entire house and garage are finished in stucco with dark wood trim. Low arch type of construction is used in the porch and all roofs are built as flat as is consistent with good construction. A pergola roof above the sun parlor adds a note of distinction. The entire exterior is impressive and elegant.

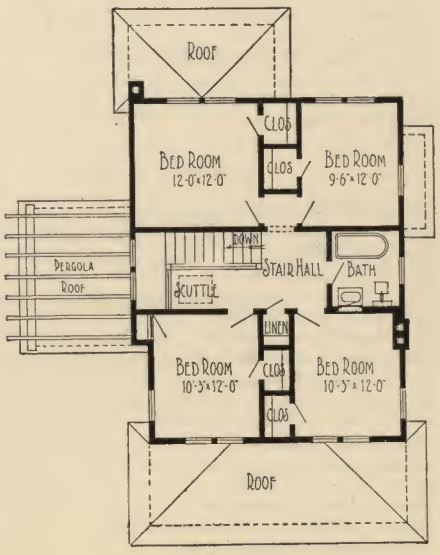
The details of interior finish are fully in keeping with the general excellence of the design, and the room arrangement is all that the particular home-builder could ask for in convenience and elegance. The reception hall is fitted with a seat and has a wide closet handily located. The opening between this hall and the living room is cased. The entire side wall of the house in the living room is occupied by the fireplace and two bookcases. A wide cased opening at the rear of the living room leads to the dining room. The buffet in the latter room is built below four windows in a square bay. There are five other windows in this room.

The sun parlor is five steps above the living room and the seat built into the nook just inside the cased opening from the living room is a very pleasant detail. The garage is entered from a passage between the living room and kitchen. Between the kitchen and the dining room is the butler's pantry. The opening on the kitchen side is cased and on the dining room side there is a double-acting door.

The stair from the sun parlor leads to a stair hall on the second floor. All rooms on this floor open from the hall. There are four bed rooms, all provided with generous closet space and a bath. All rooms are well lighted and full neight.

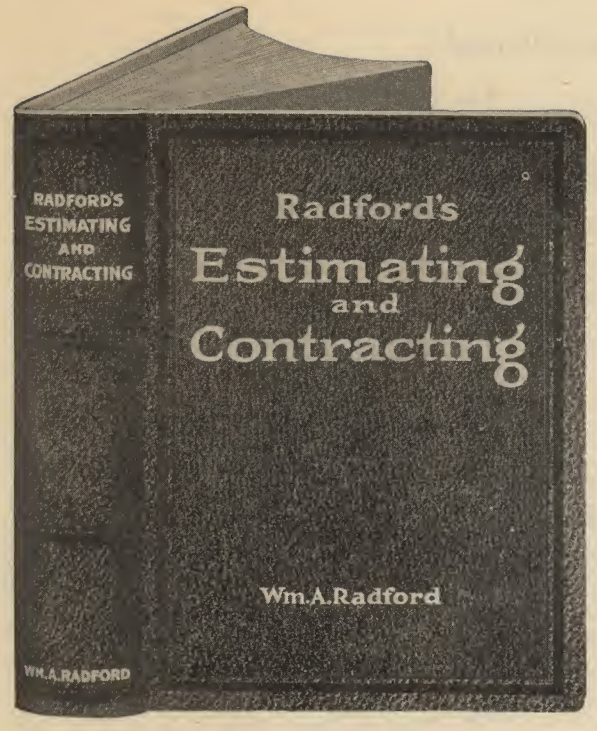


First Floor Plan.



Second Floor Plan.

Arrangement of House. Size 36 Feet 6 Inches by 33 Feet 6 Inches.



ESTIMATING AND CONTRACTING

896 Pages, 5x7¼ Inches

Handy Pocket Size. Bound in Limp Leather. Cover Gold Stamped.

A mistake in estimating, means the difference between a profit or a loss on a contract. In these days of modern construction, it is not safe to guess or go by "rule of thumb." Even experienced contractors who rely upon eyesight or rough calculations make costly errors.

Easy to Overlook Details

It is mighty easy to overlook some important detail if it is not down in black and white. Jobs are lost because of too high prices. Profits are lost because prices are too low. Be on safe ground; have a reliable, accurate guide to help you in your figuring.

Radford's Estimating and Contracting is a safe and sure guide for any contractor. Its 896 pages are filled with up-to-date methods for rapid, systematic and accurate calculation of costs of all types and details of building construction and all related work of contractors.

Helps to Easy Figuring

It gives quotations and other data indicating the cost of materials and labor, standard schedules and forms used for measurements and estimates, labor-saving tables and all other points a contractor, builder or carpenter should know.

Condensed Summary of Contents

ESTIMATING AS A SCIENCE
- General Principles of Estimating.
- Estimating Essential to All Successful Business Operations.
- Requirements of the Good Estimator.
- Accuracy Versus Guesswork.
- What to Avoid in Estimating.
- Remedies for Inaccuracies.

ESSENTIAL BASIS OF ALL ESTIMATING
- Analysis of Proposed Operations.
- Cost Finding and Cost Distribution.

CONDITIONS AFFECTING COST
- Local Market Conditions.
- Freight and Haulage.
- Rates of Wages Paid in Various Trades.

METHODS OF ESTIMATING
- Comparative and Analytic Methods.
- Approximate, Detailed, Eestimates from Carefully Figured Data.
- Estimating by Cubical Contents of Similar Structures.
- Estimating by the Square of 100 Sq. Ft.
- Estimating by Quantities.
- Unit-Costs for Material.
- Labor Costs.
- Percentage for Profit.
- Margin for Variations and Contingencies.

PRELIMINARIES TO ESTIMATING
- Fees of Architects, Consulting Engineers and Designers.
- Examination of Site.

COST FACTORS CLASSIFIED
- Factors Common to Construction in General.
- Factors Involved in Special Types of Construction.
- Factors Incidental or Accessory to Various Constructions.

COSTS COMMON TO CONSTRUCTION IN GENERAL
- Leveling and Preparing Site.
- Employer's Liability Insurance.
- Water Supply During Construction.
- Number of Men and Teams Required.
- Rates of Wages.
- Cost of Superintendence.
- Earth and Rock Excavation.
- Foundations and Footings.
- Back Filling.

COSTS INVOLVED IN SPECIAL CONSTRUCTIONS

CARPENTRY WORK
- Measurements.
- Timber and Lumber (Grades and Sizes).
- Framing.
- Sills, Joists, Studding, Columns.
- Bracing.
- Furring and Lathing.
- Scaffolding.
- Floors.
- Stairs.
- Porches and Piazzas.
- Interior Finish and Trim.
- Building Paper.
- Clapboarding.
- Shingled Siding.

ROOF CONSTRUCTION
- Framing, see Carpentry.
- Wood Shingles.
- Metal Shingles.
- Asbestos Shingles.
- Cement Shingles.
- Asphalt Roofing.
- Roofing Felt.
- Prepared Roofing.
- Tile Roofs.
- Tin Roofs.
- Corrugated Metal Roofs.
- Slate Roofs.
- Pitch and Gravel Roofs.
- Galvanized Iron Roofs.
- Cost of Laying Different Kinds of Roofs.
- Painting Roofs, see Painting.
- Skylights, see Glazing.
- Ventilators.
- Cornices.
- Ridge Rolls.
- Gutters and Downspouts.
- Flashings.

MILL WORK
- Doors and Door-Frames.
- Sash and Window Frames.
- Blinds.
- Transoms.
- Mouldings.
- Columns and Capitals.
- Cupboard Doors.
- Store Fronts.
- Thresholds.
- Stairs and Handrails.
- Newels and Balusters.
- Grills and Spindles.
- Mantels and Consoles.
- Chair and Plate Rails.
- Wainscoting.
- Screens and Weather Strips.
- Clothes Line Posts.

CONCRETE CONSTRUCTION
- Concrete Houses.
- Reinforced Concrete.
- Masonry Construction.
- Steel Construction.
- Heating, Ventilating.
- Plumbing, Gas Fitting.
- Electric Wiring, Plastering.
- Painting, Decorating.
- Paperhanging, Glazing.
- Hardware, Roads and Pavements.

PRICE, Postpaid, $5.00

RADFORD ARCHITECTURAL COMPANY

1827 PRAIRIE AVENUE, CHICAGO ILL.

HOW TO READ PLANS
AND
TAKE OFF BILLS OF MATERIAL

By WM. A. RADFORD